

247	HJACG02	Immune	diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving epithelial cells or the renal system). (The 293 cell line is a human embryonal kidney epithelial cell line available through the ATCC as cell line number CRL-1573).	HUVEC	ICAM	gb X06990 HSI CAM1
247	HJACG02	Immune	Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving endothelial cells). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving endothelial cells). (HUVEC cells are human umbilical vein endothelial cells).	Jurkat	Rag2 TNF	gb AY011962  AY011962 gb AJ270944 H SA27094
247	HJACG02	Immune	Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving T-cells). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving T-cells). (The Jurkat cell line is a human T lymphocyte cell line available through the ATCC as cell line number TIB-152).	NHDF	Rag1	gb M29474 HU MRAG1
247	HJACG02	Immune	Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving the skin). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving the skin). (NHDF cells are normal human dermal fibroblasts).	U937	GATA1 IL5 TNF	gb X17254 HS ERYF1 gb X12705 HS BCDFIA

				invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving monocytes). (The U937 cell line is a human monocyte cell line available through the ATCC as cell line number CRL-1593.2).			gb AJ270944 H SA27094
262	HKACD58	Immune		Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving muscle tissues and the cardiovascular system (e.g. heart, lungs, circulatory system)). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving muscle tissue or the cardiovascular system). (AOSMC cells are human aortic smooth muscle cells).	AOSMC	VCAM	gb A30922 A30 922
262	HKACD58	Immune		Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving the B-cells). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving B-cells). (The Daudi cell line is a human B lymphoblast cell line available through the ATCC as cell line number CCL-213).	Daudi	CD40	gb AJ300189 H SA30018
262	HKACD58	Immune		Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving endothelial cells). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving endothelial cells). (HUVEC cells are human umbilical vein endothelial cells).	HUVEC	ICAM Rag1	gb X06990 HSI CAM1 gb M29474 HU MRAG1
262	HKACD58	Immune		Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving endothelial cells). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving endothelial cells). (HUVEC cells are human umbilical vein endothelial cells).	Liver	CD28	gb AF222342 A F222342



262	HKACD58	Immune	Related Disorders" (particularly including, but not limited to, immune disorders involving cells of the hepatic system). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving cells of the hepatic system).	NHDF	CXCR3 GATA1 IL6 VCAM	gb Z79783 HS CKRL2 gb X17254 HS ERYF1 gb X04403 HS2 6KDAR gb A30922 A30 922
262	HKACD58	Immune	Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving the skin). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving the skin). (NHDF cells are normal human dermal fibroblasts).	THP1	CIS3	gb AB006967  AB006967
262	HKACD58	Immune	Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving monocytes). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving monocytes). (The THP1 cell line is a human monocyte cell line available through the ATCC as cell line number TIB-202).	U937	CD69 TNF	gb Z22576 HS CD69GNA gb AJ270944 H SA27094
277	HL2AC08	Immune	Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-	TF-1	CD69 GATA1	gb Z22576 HS CD69GNA

383			Related Disorders" (particularly including, but not limited to, immune disorders involving erythrocytes). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving erythrocytes). (The TF-1 cell line is a human erythroblast cell line available through the ATCC as cell line number CRL-2003).		TNF	gb X17254 HS ER YFI gb AJ270944 H SA27094
383	HNHFO29	Immune	Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving erythrocytes). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving erythrocytes). (The TF-1 cell line is a human erythroblast cell line available through the ATCC as cell line number CRL-2003).	TF-1	CD40 TNF	gb AJ300189 H SA30018 gb AJ270944 H SA27094
383	HNHFO29	Immune	Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving monocytes). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving monocytes). (The U937 cell line is a human monocyte cell line available through the ATCC as cell line number CRL-1593.2).	U937	ICAM	gb X06990 HSI CAM1
470	HSDSB09	Immune	Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving muscle tissues and the cardiovascular system (e.g. heart, lungs, circulatory system)). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving muscle tissue or the cardiovascular system). (AOSMC cells are human aortic smooth	AOSMC	CCR3 CCR4 CD25 CD30 CD40 CTLA4 IL5 Rag1 VCAM	gb AB023887  AB023887 gb AB023888  AB023888 gb X03137 HSI L2RG7 gb AJ300189 H SA30018

			muscle cells).			gb AF316875 A F316875 gb X12705 HS BCDFIA gb M29474 HU MRAG1 gb A30922 A30 922
470	HDSB09	Immune	Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving the cells of the gastrointestinal tract). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving cells of the gastrointestinal tract). (The Caco-2 cell line is a human colorectal adenocarcinoma cell line available through the ATCC as cell line number HTB-37).	Caco-2	c-maf GATA3 ICAM Rag1	gb AF055377 A F055377 gb X55037 HS GATA3 gb X06990 HSI CAM1 gb M29474 HU MRAG1
470	HDSB09	Immune	Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving the B-cells). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving B-cells). (The Daudi cell line is a human B lymphoblast cell line available through the ATCC as cell line number CCL-213).	Daudi	TNF	gb AJ270944 H SA27094
470	HDSB09	Immune	Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving the T-cells). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving T-cells). (The	H9	CIS3 Rag1	gb AB006967  AB006967 gb M29474 HU MRAG1

470	HSDSB09	Immune	H9 cell line is a human T lymphocyte cell line available through the ATCC as cell line number HTB-176). Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving epithelial cells or the renal system). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving epithelial cells or the renal system). (The 293 cell line is a human embryonal kidney epithelial cell line available through the ATCC as cell line number CRL-1573).	HEK293	CCR3 CCR4 CD25 CD30 CD40 CTLA4 GATA3 Rag1 TNF VCAM	gb AB023887  AB023887 gb AB023888  AB023888 gb X03137 HSI L2RG7  gb AJ300189 H SA30018 gb AF316875 A F316875 gb X55037 HS GATA3 gb M29474 HU MRAG1 gb AJ270944 H SA27094 gb A30922 A30 922
470	HSDSB09	Immune	Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving endothelial cells). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving endothelial cells). (HUVEC cells are human umbilical vein endothelial cells).	HUVEC	CD40 ICAM IL10 Rag1 Rag2 TNF	gb AJ300189 H SA30018 gb X06990 HSI CAM1 gb AF055467 A F055467 gb M29474 HU MRAG1 gb AY011962  AY011962 gb AJ270944 H SA27094
470	HSDSB09	Immune	Highly preferred indications include immunological disorders such as	Jurkat	CD69	gb Z22576 HS

				described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving T-cells). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving T-cells). (The Jurkat cell line is a human T lymphocyte cell line available through the ATCC as cell line number TIB-152).		IL5 Rantes TNF	CD69GNA gb X12705 HS BCDFIA gb AF043341 A F043341 gb AJ270944 H SA27094
470	HSDSB09	Immune		Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving cells of the hepatic system). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving cells of the hepatic system).	Liver	CD25	gb X03137 HSI L2RG7
470	HSDSB09	Immune		Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving T-cells). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving T-cells). (The Molt-4 cell line is a human T-cell line available through the ATCC as cell line number CRL-1582).	Molt4	CD28	gb AF222342 A F222342
470	HSDSB09	Immune		Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving the skin). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving the skin). (NHDF cells are normal human dermal fibroblasts).	NHDF	CD28 CD40 Il6	gb AF222342 A F222342 gb AJ300189 H SA30018 gb X04403 HS2 6KDAR
470	HSDSB09	Immune		Highly preferred indications include immunological disorders such as	SK-N-MC	c-maf	gb AF055377 A

			described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving the central nervous system). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving the central nervous system). (The SK-N-MC neuroblastoma cell line is a cell line derived from human brain tissue and is available through the ATCC as cell line number HTB-10).	neuroblastoma	CIS3 TNF	F055377 gb AB006967  AB006967 gb AJ270944 H SA27094
470	HSDSB09	Immune	Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving T-cells). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving T-cells). (The SUPT cell line is a human T-cell line).	SUPT	TNF VCAM	gb AJ270944 H SA27094 gb A30922 A30 922
470	HSDSB09	Immune	Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving monocytes). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving monocytes). (The THP1 cell line is a human monocyte cell line available through the ATCC as cell line number TIB-202).	THP1	CCR3 CD40 GATA3 ICAM IL5 Rag2 VCAM	gb AB023887  AB023887 gb AJ300189 H SA30018 gb X55037 HS GATA3 gb X06990 HSI CAM1 gb X12705 HS BCDFA gb AY011962  AY011962 gb A30922 A30 922
470	HSDSB09	Immune	Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving monocytes). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving monocytes). (The THP1 cell line is a human monocyte cell line available through the ATCC as cell line number TIB-202).	U937	IL1B	gb X02532 HSI L1BR

562	HUKBT29	Immune	disorders involving monocytes). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving monocytes). (The U937 cell line is a human monocyte cell line available through the ATCC as cell line number CRL-1593.2).	U937	CD69	gb Z22576 HS CD69GNA
584	HWHGZ51	Immune	Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving monocytes). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving monocytes). (The U937 cell line is a human monocyte cell line available through the ATCC as cell line number CRL-1593.2).	AOSMC	CD30 II6	gb X04403 HS2 6KDAR
584	HWHGZ51	Immune	Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving muscle tissues and the cardiovascular system (e.g. heart, lungs, circulatory system)). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving muscle tissue or the cardiovascular system). (AOSMC cells are human aortic smooth muscle cells).	Caco-2	Rag1	gb M29474 HU MRAG1

584	HWHGZ51	Immune	line number HTB-37). Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving the B-cells). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving B-cells). (The Daudi cell line is a human B lymphoblast cell line available through the ATCC as cell line number CCL-213).	Daudi	CIS3 CXCR3 ICAM	gb AB006967  AB006967 gb Z79783 HS CKRL2 gb X06990 HSI CAM1
584	HWHGZ51	Immune	Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving the T-cells). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving T-cells). (The H9 cell line is a human T lymphocyte cell line available through the ATCC as cell line number HTB-176).	H9	IL5 VCAM VLA4	gb X12705 HS BCDFA gb A30922 A30 922 gb X16983 HSI NTAL4
584	HWHGZ51	Immune	Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving epithelial cells or the renal system). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving epithelial cells or the renal system). (The 293 cell line is a human embryonal kidney epithelial cell line available through the ATCC as cell line number CRL-1573).	HEK293	Rag1 TNF	gb M29474 HU MRAG1 gb AJ270944 H SA27094
584	HWHGZ51	Immune	Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving endothelial cells). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing,	HUVEC	CCR7 GATA3 TNF	gb X84702 HS DNABLR2 gb X55037 HS GATA3 gb AJ270944 H



						SA27094
584	HWHGZ51	Immune	treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving endothelial cells). (HUVEC cells are human umbilical vein endothelial cells). Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving T-cells). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving T-cells). (The Jurkat cell line is a human T lymphocyte cell line available through the ATCC as cell line number TIB-152).	Jurkat	Rag1 Rag2	gb M29474 HU MRAG1 gb AY011962  AY011962
584	HWHGZ51	Immune	Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving cells of the hepatic system). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving cells of the hepatic system).	Liver	CCR7 ICAM TNF VCAM	gb X84702 HS DNABLR2 gb X06990 HSI CAM1 gb AJ270944 H SA27094 gb A30922 A30 922
584	HWHGZ51	Immune	Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving T-cells). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving T-cells). (The Molt-4 cell line is a human T-cell line available through the ATCC as cell line number CRL-1582).	Molt4	CD25 TNF VCAM	gb X03137 HSI L2RG7 gb AJ270944 H SA27094 gb A30922 A30 922
584	HWHGZ51	Immune	Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving the skin). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating	NHDF	CCR7 CD40 GATA3 HLA-c TNF	gb X84702 HS DNABLR2 gb AJ300189 H SA30018 gb X55037 HS

			and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving the skin). (NHDF cells are normal human dermal fibroblasts).			GATA3 gb AJ270944 H SA27094
584	HWHGZ51	Immune	Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving the central nervous system). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving the central nervous system). (The SK-N-MC neuroblastoma cell line is a cell line derived from human brain tissue and is available through the ATCC as cell line number HTB-10).	SK-N-MC neuroblastoma	CIS3 LTBR Rag1	gb AB006967  AB006967 gb AK027080  AK027080 gb M29474 HU MRAG1
584	HWHGZ51	Immune	Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving T-cells). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving T-cells). (The SUPT cell line is a human T-cell line).	SUPT	CCR4 Rag1 TNF	gb AB023888  AB023888 gb M29474 HU MRAG1 gb AJ270944 H SA27094
584	HWHGZ51	Immune	Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving monocytes). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving monocytes). (The THP1 cell line is a human monocyte cell line available through the ATCC as cell line number TIB-202).	THP1	c-maf CCR7 CXCR3 IL5	gb AF055377 A F055377 gb X84702 HS DNABLR2 gb Z79783 HS CKRL2 gb X12705 HS BCDFIA
584	HWHGZ51	Immune	Highly preferred indications include immunological disorders such as described herein under the heading "Immune Activity" and/or "Blood-Related Disorders" (particularly including, but not limited to, immune disorders involving monocytes). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving monocytes). (The THP1 cell line is a human monocyte cell line available through the ATCC as cell line number TIB-202).	U937	CD69 ICAM TNF	gb Z22576 HS CD69GNA gb X06990 HSI

			disorders involving monocytes). Highly preferred embodiments of the invention include methods of preventing, detecting, diagnosing, treating and/or ameliorating disorders of the immune system (particularly including, but not limited to, immune disorders involving monocytes). (The U937 cell line is a human monocyte cell line available through the ATCC as cell line number CRL-1593.2).			CAM1 gb AJ270944 H SA27094
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Table 2 further characterizes certain encoded polypeptides of the invention, by providing the results of comparisons to protein and protein family databases. The first column provides a unique clone identifier, "Clone ID NO:", corresponding to a cDNA clone disclosed in Table 1A and/or Table 1B. The second column provides the unique contig identifier, "Contig ID:" which allows correlation with the information in Table 1B. The third column provides the sequence identifier, "SEQ ID NO:", for the contig polynucleotide sequences. The fourth column provides the analysis method by which the homology/identity disclosed in the Table was determined. The fifth column provides a description of the PFAM/NR hit identified by each analysis. Column six provides the accession number of the PFAM/NR hit disclosed in the fifth column. Column seven, score/percent identity, provides a quality score or the percent identity, of the hit disclosed in column five. Comparisons were made between polypeptides encoded by polynucleotides of the invention and a non-redundant protein database (herein referred to as "NR"), or a database of protein families (herein referred to as "PFAM"), as described below.

The NR database, which comprises the NBRF PIR database, the NCBI GenPept database, and the SIB SwissProt and TrEMBL databases, was made non-redundant using the computer program nrdb2 (Warren Gish, Washington University in Saint Louis). Each of the polynucleotides shown in Table 1B, column 3 (e.g., SEQ ID NO:X or the 'Query' sequence) was used to search against the NR database. The computer program BLASTX was used to compare a 6-frame translation of the Query sequence to the NR database (for information about the BLASTX algorithm please see Altshul et al., J. Mol. Biol. 215:403-410 (1990), and Gish and States, Nat. Genet. 3:266-272 (1993). A description of the sequence that is most similar to the Query sequence (the highest scoring 'Subject') is shown in column five of Table 2 and the database accession number for that sequence is provided in column six. The highest scoring 'Subject' is reported in Table 2 if (a) the estimated probability that the match occurred by chance alone is less than  $1.0 \times 10^{-7}$ , and (b) the match was not to a known repetitive element. BLASTX returns alignments of short polypeptide segments of the Query and Subject sequences which share a high degree of similarity; these segments are known as High-Scoring Segment Pairs or HSPs. Table 2 reports the degree of similarity between the Query and the Subject for each HSP as a percent identity in Column 7. The percent identity is determined by dividing the number of exact matches between the two aligned sequences in the HSP, dividing by the number of Query amino acids in the HSP and multiplying by 100. The polynucleotides of SEQ ID NO:X which encode the polypeptide sequence that generates an HSP are delineated by columns 8 and 9 of Table 2.

The PFAM database, PFAM version 2.1, (Sonnhammer, Nucl. Acids Res., 26:320-322, 1998) consists of a series of multiple sequence alignments; one alignment for each protein family. Each multiple sequence alignment is converted into a probability model called a Hidden

Markov Model, or HMM, that represents the position-specific variation among the sequences that make up the multiple sequence alignment (see, e.g., Durbin, et al., *Biological sequence analysis: probabilistic models of proteins and nucleic acids*, Cambridge University Press, 1998 for the theory of HMMs). The program HMMER version 1.8 (Sean Eddy, Washington University in Saint Louis) was used to compare the predicted protein sequence for each Query sequence (SEQ ID NO:Y in Table 1B) to each of the HMMs derived from PFAM version 2.1. A HMM derived from PFAM version 2.1 was said to be a significant match to a polypeptide of the invention if the score returned by HMMER 1.8 was greater than 0.8 times the HMMER 1.8 score obtained with the most distantly related known member of that protein family. The description of the PFAM family which shares a significant match with a polypeptide of the invention is listed in column 5 of Table 2, and the database accession number of the PFAM hit is provided in column 6. Column 7 provides the score returned by HMMER version 1.8 for the alignment. Columns 8 and 9 delineate the polynucleotides of SEQ ID NO:X which encode the polypeptide sequence which show a significant match to a PFAM protein family.

As mentioned, columns 8 and 9 in Table 2, "NT From" and "NT To", delineate the polynucleotides of "SEQ ID NO:X" that encode a polypeptide having a significant match to the PFAM/NR database as disclosed in the fifth column. In one embodiment, the invention provides a protein comprising, or alternatively consisting of, a polypeptide encoded by the polynucleotides of SEQ ID NO:X delineated in columns 8 and 9 of Table 2. Also provided are polynucleotides encoding such proteins, and the complementary strand thereto.

The nucleotide sequence SEQ ID NO:X and the translated SEQ ID NO:Y are sufficiently accurate and otherwise suitable for a variety of uses well known in the art and described further below. For instance, the nucleotide sequences of SEQ ID NO:X are useful for designing nucleic acid hybridization probes that will detect nucleic acid sequences contained in SEQ ID NO:X or the cDNA contained in ATCC Deposit No:Z. These probes will also hybridize to nucleic acid molecules in biological samples, thereby enabling immediate applications in chromosome mapping, linkage analysis, tissue identification and/or typing, and a variety of forensic and diagnostic methods of the invention. Similarly, polypeptides identified from SEQ ID NO:Y may be used to generate antibodies which bind specifically to these polypeptides, or fragments thereof, and/or to the polypeptides encoded by the cDNA clones identified in, for example, Table 1A and/or 1B.

Nevertheless, DNA sequences generated by sequencing reactions can contain sequencing errors. The errors exist as misidentified nucleotides, or as insertions or deletions of nucleotides in the generated DNA sequence. The erroneously inserted or deleted nucleotides cause frame shifts in the reading frames of the predicted amino acid sequence. In these cases, the predicted amino acid sequence diverges from the actual amino acid sequence, even though the

generated DNA sequence may be greater than 99.9% identical to the actual DNA sequence (for example, one base insertion or deletion in an open reading frame of over 1000 bases).

Accordingly, for those applications requiring precision in the nucleotide sequence or the amino acid sequence, the present invention provides not only the generated nucleotide sequence identified as SEQ ID NO:X, and a predicted translated amino acid sequence identified as SEQ ID NO:Y, but also a sample of plasmid DNA containing cDNA ATCC Deposit No:Z (e.g., as set forth in columns 2 and 3 of Table 1A and/or as set forth, for example, in Table 1B, 6, and 7). The nucleotide sequence of each deposited clone can readily be determined by sequencing the deposited clone in accordance with known methods. Further, techniques known in the art can be used to verify the nucleotide sequences of SEQ ID NO:X. The predicted amino acid sequence can then be verified from such deposits. Moreover, the amino acid sequence of the protein encoded by a particular clone can also be directly determined by peptide sequencing or by expressing the protein in a suitable host cell containing the deposited human cDNA, collecting the protein, and determining its sequence.

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Table 2

cDNA Clone ID	Contig ID:	SEQ ID NO: X	Analysis Method	PFam/NR Description	PFam/NR Accession Number	Score/Percent Identity	NT From	NT To
H6EAB28	589947	603	WUblastx.64	(Q9NXY7) CHONDROITIN 4-O-SULFOTRANSFERASE (CHONDROITIN 4-O-SULFOTRANS	Q9NXY7	49% 60% 100% 100% 38% 98%	205 1123 116 1200 1118 413	396 1206 202 1352 1231 1132
H6EDX46	637786	604	WUblastx.64	(Q9UHE9) ZSIG9 PROTEIN (TRANSMEMBRANE PROTEIN 4).	Q9UHE9	100%	188	379
HACBD91	637482	17	WUblastx.64	NADH dehydrogenase (ubiquinone) (EC 1.6.5.3) chain NDUFB4 - human	pir JE0383 JE0383	100% 95%	211 1306	357 1368
HACCI17	891114	18	HMMER 2.1.1	PFAM: PMP-22/EMP/MP20/Claudin family	PF00822	142.7	470	1003
			WUblastx.64	(AAH19290) Hypothetical 27.7 kDa protein (Fragment)	AAH19290	100%	317	1114
HACCI17	731877	605	HMMER 2.1.1	PFAM: PMP-22/EMP/MP20/Claudin family	PF00822	35.6	144	329
			blastx.2	(AF000959) transmembrane protein [Homo sapiens]	gb AAC51364.1	100% 93% 75%	311 135 535	619 329 786
HADA089	570689	19	WUblastx.64	(Q9P147) PRO2822.	Q9P147	73%	1106	885
HAGA185	381942	21	WUblastx.64	(O15432) PROBABLE LOW-AFFINITY COPPER UPTAKE PROTEIN 2 (HCT	COP2_HUMAN	100% 96%	91 228	234 518
HAGAN21	1026956	23	WUblastx.64	(AAH07558) Unknown (protein for MGC:15483).	AAH07558	50% 46%	797 726	708 532
HAGBZ81	456414	24	WUblastx.64	(Q9H291) JUNCTATE.	Q9H291	85% 77%	183 26	329 199
HAGDGS9	534165	25	HMMER 2.1.1	PFAM: short chain dehydrogenase	PF00106	182.2	232	795

			WUblastx.64	(Q9UKU4) RETINAL SHORT-CHAIN DEHYDROGENASE/REDUCTASE RETSDR2. (Q9GMK2) HYPOTHETICAL 10.0 KDA PROTEIN.	Q9UKU4	96%	124	1023
HAHDB16	635412	28	WUblastx.64		Q9GMK2	75% 69%	641 762	522 634
HAHDR32	635357	29	WUblastx.64	(Q9HBU9) POPEYE PROTEIN 2.	Q9HBU9	92%	77	811
HAIBP89	727543	31	WUblastx.64	(Q96G79) Similar to RIKEN cDNA 2610030J16 gene.	Q96G79	99%	290	1261
HAJCP19	422672	32	WUblastx.64	(Q9H173) SIL1 PROTEIN PRECURSOR.	Q9H173	100%	83	1465
HAJBR69	638516	35	WUblastx.64	(Q9JIG5) UBIQUITIN SPECIFIC PROTEASE (FRAGMENT).	Q9JIG5	69%	677	48
HAJBZ75	618530	36	WUblastx.64	hypothetical protein DKFZp564D116.1 - human (fragment)	pir T08708 T 08708	99%	25	1869
HAMFC93	904749	37	WUblastx.64	(Q9BGQ6) HYPOTHETICAL 30.3 KDA PROTEIN.	Q9BGQ6	80%	1	666
HAMFC93	900586	611	WUblastx.64	(Q9BGQ6) HYPOTHETICAL 30.3 KDA PROTEIN.	Q9BGQ6	94% 81%	576 4	686 573
HAPPW30	1352278	40	blastx.14	(AAH20263) Hypothetical 28.7 kDa protein.	AAH20263	91%	59	850
HAPPW30	684272	613	WUblastx.64	(AAH20263) Hypothetical 28.7 kDa protein.	AAH20263	100% 36% 100%	54 982 266	263 1056 844
HAPQT22	587601	41	WUblastx.64	(Q9H387) PRO2550.	Q9H387	100% 68%	462 631	439 461
HASAV70	1300782	42	WUblastx.64	(Q9NY08) 19A PROTEIN.	Q9NY08	82%	7	423
HASAV70	381953	614	WUblastx.64	(Q9NY08) 19A PROTEIN.	Q9NY08	100%	4	432
HATAC53	1352276	44	blastx.14	(AAH19903) Hypothetical 29.4 kDa protein (Fragment)	AAH19903	100% 100% 39%	64 811 1212	699 840 1280
HATAC53	667830	615	WUblastx.64	(AAH19903) Hypothetical 29.4 kDa protein (Fragment)	AAH19903	98% 66%	66 516	593 665
HATBR65	635514	45	WUblastx.64	(Q9H728) CDNA: FLJ21463 FIS, CLONE COL04765.	Q9H728	70% 68%	750 801	610 754
HATCP77	748244	47	WUblastx.64	(Q9Y691) MAXIK CHANNEL BETA 2 SUBUNIT (LARGE CONDUCTANCE CALCIUM-ACTI	Q9Y691	100%	10	582
HATDF29	845965	48	WUblastx.64	(Q95803) HEPARAN SULFATE N-DEACETYLASE/N- SULFOTRANSFERASE 3.	O95803	93%	143	1216
HATDM46	974065	49	WUblastx.64	(AAH07609) Similar to hypothetical protein PRO1722.	AAH07609	87%	2053	2030



[illegible]

HBIMB51	672711	623	WUblastx.64	(Q924A4) Urocortin III.	Q924A4	61%	296	517
HBINS58	1352386	59	blastx.14	(Q9D6W7) 2310047N01RIK PROTEIN.	Q9D6W7	64%	93	302
HBINS58	961712	624	WUblastx.64	(Q9D6W7) 2310047N01RIK PROTEIN.	Q9D6W7	82%	255	578
HBINS58	892924	625	blastx.2	(AF106518) sialomucin CD164 [Homo sapiens]	gb AAC8247.3.1	64%	177	251
HBJFU48	460392	60	WUblastx.64	(Q9P195) PRO1722.	Q9P195	78%	191	589
HBJID05	1130660	61	WUblastx.64	probable ATP-binding component of ABC transporter PA4064 [imported] - Pseudomonas aeruginosa (strain PAO1)	pir H83138 H83138	33%	241	576
HBJID05	544980	626	WUblastx.64	hypothetical protein PA4063 [imported] - Pseudomonas aeruginosa (strain PAO1)	pir G83138 G83138	61%	137	448
HBJTY92	778065	62	WUblastx.64	(Q9P529) Hypothetical 15.2 kDa protein.	Q9P529	91%	2333	2434
HBJU28	561723	63	WUblastx.64	(Q9H728) CDNA: FLJ21463 FIS, CLONE COL04765.	Q9H728	86%	2325	2432
HBJLC01	638410	64	WUblastx.64	X-linked retinopathy protein (C-terminal, clone XEH.8c) - human (fragment)	pir A46010 A46010	86%	2326	2433
HBJLF01	732111	65	HMMER 2.1.1	PFAM: Transmembrane 4 family	PF00335	100%	2348	2434
HBJNC59	1125802	67	WUblastx.64	(Q9D7W4) 2210021G21RIK PROTEIN.	Q9D7W4	96%	2348	2434
HBJNC59	899397	627	HMMER 2.1.1	complement subcomponent C1q chain A precursor [validated] - human	pir S14350 C1HUQA	86%	2344	2433
				PFAM: Collagen triple helix repeat (20 copies)	PF01391	91%	2333	2434
			WUblastx.64	(Q9H2L7) DC33.	Q9H2L7	61%	991	836
						64%	1152	976
						65%	829	707
						131.8	223	891
						46%	133	894
						91%	66	800
						30.1	144	245
						79%	77	907

HBJNC59	902207	628	HMMER 2.1.1 blastx.2	PFAM: C1q domain	PF00386	250.2	409	786
				(AF135157) complement C1q A chain precursor [Homo sapiens]	gb AAD3262 6.1 AF13515 7_1	91%	64	798
HBOEG11	1300752	69	WUblastx.64	(O76076) CONNECTIVE TISSUE GROWTH FACTOR-LIKE PROTEIN PRECURSOR (BA44)	O76076	75%	57	806
HBOEG11	1121709	629	HMMER 2.1.1 WUblastx.64	PFAM: Insulin-like growth factor binding proteins	PF00219	45.4	128	340
				(O76076) CONNECTIVE TISSUE GROWTH FACTOR-LIKE PROTEIN PRECURSOR (BA44)	O76076	75%	53	802
HBOEG11	1049830	630	HMMER 2.1.1 WUblastx.64	PFAM: Insulin-like growth factor binding proteins	PF00219	45.4	122	334
				(O76076) CONNECTIVE TISSUE GROWTH FACTOR-LIKE PROTEIN PRECURSOR (BA44)	O76076	100%	47	796
HBOEG69	793786	70	WUblastx.64	(Q9NS11) LIPOPOLYSACCHARIDE SPECIFIC RESPONSE- 68 PROTEIN.	Q9NS11	71% 100%	424 345	314 196
HBXFL29	842802	71	WUblastx.64	(AAL36460) POB1.	AAL36460	99%	4	1008
HCACU58	625923	72	WUblastx.64	(Q9NX85) CDNA FLJ20378 FIS, CLONE KAI0536.	Q9NX85	62%	497	820
HCACV51	1306706	73	WUblastx.64	(Q99LM9) UNKNOWN (PROTEIN FOR MGC:8251).	Q99LM9	85%	8	1009
HCACV51	598022	631	WUblastx.64	(Q96BN2) Similar to RIKEN cDNA 2900026B15 gene.	Q96BN2	97% 100%	13 290	312 1015
HCDBW86	520435	74	WUblastx.64	(Q96P03) Transient receptor potential channel 4 zeta splice variant.	Q96P03	100% 100%	630 463	589 371
HCE1Q89	520329	75	WUblastx.64	(Q9NX85) CDNA FLJ20378 FIS, CLONE KAI0536.	Q9NX85	86% 61% 65%	590 645 859	525 592 683
HCE2F54	634016	76	HMMER 2.1.1 WUblastx.64	PFAM: Histone-like transcription factor (CBF/NF-Y) and archaeal histone	PF00808	19	868	1005
				(AAH07642) Unknown (protein for IMAGE:3534358) (Fra	AAH07642	99%	298	1122
HCE3G69	728432	77	WUblastx.64	(Q9H0K7) HYPOTHETICAL 12.4 KDA PROTEIN (UNKNOWN) (PROTEIN FOR MGC:303	Q9H0K7	100%	1294	1647
HCE3G69	494346	632	blastx.2	(AL136758) hypothetical protein [Homo sapiens]	emb CAB666	100%	1295	1648

					92.1]			
HCEEA88	634967	78	WUblastx.64	(P57054) DOWN SYNDROME CRITICAL REGION PROTEIN 5 (DOWN SYND	DSR5_HUM AN	100%	134	286
HCEFB69	748245	79	HMMER 2.1.1	PFAM: Mitochondrial carrier proteins	PF00153	123.9	308	781
			WUblastx.64	(Q9HC61) MITOCHONDRIAL UNCOUPLING PROTEIN 5 SHORT FORM WITH INSERTION	Q9HC61	96%	1093	1185
						47%	1264	1320
						98%	188	781
HCEFB80	1143407	80	WUblastx.64	(Q96FR3) Unknown (protein for MGC:18083).	Q96FR3	81%	1785	1979
HCEGR33	425212	81	WUblastx.64	(Q9H743) CDNA: FLJ21394 FIS, CLONE COL03536.	Q9H743	51%	1002	1079
						42%	1379	1492
						58%	907	993
HCEMP62	684780	82	WUblastx.64	(AAL55739) Hypothetical 43.7 kDa protein.	AAL55739	94%	484	897
						94%	88	459
						40%	1	198
						94%	870	926
HCEWE17	941941	84	WUblastx.64	(Q9H310) RH TYPE B GLYCOPROTEIN.	Q9H310	84%	9	293
						92%	444	566
HCEWE17	893535	635	WUblastx.64	(Q9H310) RH TYPE B GLYCOPROTEIN.	Q9H310	80%	467	544
						75%	695	730
						83%	3	482
HCEWE20	543370	85	WUblastx.64	(Q9P1J1) PRO1546.	Q9P1J1	76%	501	551
						79%	601	717
HCFOM18	553582	89	WUblastx.64	(Q9H728) CDNA: FLJ21463 FIS, CLONE COL04765.	Q9H728	60%	621	490
HCHNF25	658672	637	WUblastx.64	(AAH00499) Jumping translocation breakpoint.	AAH00499	91%	180	620
HCMST14	562010	92	WUblastx.64	(Q96DD7) Hypothetical 24.9 kDa protein (Fragment).	Q96DD7	100%	10	99
HCMTB45	862367	93	WUblastx.64	(Q9UI48) PRO0663 (FRAGMENT).	Q9UI48	67%	748	656
						61%	952	914
HCMTB45	562034	638	WUblastx.64	(Q9UI48) PRO0663 (FRAGMENT).	Q9UI48	67%	741	649
						61%	945	907
HCOOS80	1134974	95	WUblastx.64	(Q60838) SEGMENT POLARITY PROTEIN DISHEVELLED HOMOLOG DVL-2	DVL2_MOU SE	47%	8	307
						42%	440	637
						100%	636	677

HCOOS80	1045182	639	blastx.2	similar to Dvl-1 product encoded by GenBank Accession Number 1	gb AAC52827.1	100% 100% 39% 36% 45%	21 588 80 8 444	128 683 163 94 509
HCUCK44	720291	98	WUblastx.64	hypothetical protein DKFZp564J157.1 - human (fragment)	pir T34520 T34520	97%	21	524
HCUJO60	499242	99	WUblastx.64	(Q96MM0) CDNA FLJ32172 fis, clone PLACE6000555.	Q96MM0	79% 72%	1043 1222	972 1028
HCUHK65	651313	101	WUblastx.64	(Q9H3W5) HYPOTHETICAL 79.4 KDA PROTEIN.	Q9H3W5	100%	11	316
HCUHK65	880178	642	HMMER 2.1.1	PFAM: Leucine Rich Repeat	PF00560	92.1	1190	1261
			WUblastx.64	(Q9H3W5) HYPOTHETICAL 79.4 KDA PROTEIN.	Q9H3W5	100%	770	2893
HCWEB58	1352416	103	blastx.14	(Q92WW6) Putative sensor histidine kinase protein.	Q92WW6	36% 51% 55% 41% 37%	355 946 853 264 757	720 1167 933 335 828
HCWEB58	1115089	643	HMMER 2.1.1	PFAM: Domain found in bacterial signal proteins	PF00672	40.4	442	651
			WUblastx.64	sensor histidine kinase [imported] - Caulobacter crescentus	pir A87396 A87396	36%	379	915
HCWEB58	889268	644	HMMER 2.1.1	PFAM: Domain found in bacterial signal proteins	PF00672	41.6	350	559
			blastx	sensor-like protein [Coxiella burnetii]	gb AA81939.1	39%	419	829
HCWGU37	1042325	104	WUblastx.64	(Q9H728) CDNA: FLJ21463 FIS, CLONE COL04765.	Q9H728	86% 77% 77% 73% 70%	2588 2459 2521 2373 2730	2523 2409 2441 2329 2587
HCWKC15	553621	105	WUblastx.64	(Q9NX85) CDNA FLJ20378 FIS, CLONE KAIA0536.	Q9NX85	77% 56%	538 710	419 663

HDHEB60	499233	107	WUblastx.64	(Q9Y5Y5) PEROXISOMAL BIOGENESIS FACTOR 16.	Q9Y5Y5	63%	708	532
HDHIA94	765171	108	HMMER 2.1.1	PFAM: Sodium/calcium exchanger protein	PF01699	81% 121.4	277 178	1284 615
HDHIA94	637576	646	WUblastx.64 HMMER 2.1.1	(Q9HC58) SODIUM/CALCIUM EXCHANGER NCKX3. PFAM: Sodium/calcium exchanger protein	Q9HC58 PF01699	98% 22.9	10 187	657 273
			blastx.2	(AF025664) Na-Ca+K exchanger [Bos taurus]	gb AAB8888 4.1	42% 37%	224 16	637 273
HDHMA45	902513	109	WUblastx.64	(Q9H3S3) TRANSMEMBRANE PROTEASE, SERINE 5 (EC 3.4.21.-) (SP)	TMS5_HUM AN	91%	175	1428
HDHMA45	812764	647	HMMER 2.1.1	PFAM: Trypsin	PF00089	296.3	723	1415
			WUblastx.64	(Q9H3S3) TRANSMEMBRANE PROTEASE, SERINE 5 (EC 3.4.21.-) (SP)	TMS5_HUM AN	99%	180	1442
HDHMA72	547772	110	WUblastx.64	(AAH17663) Hypothetical 55.1 kDa protein.	AAH17663	28% 95% 50% 99%	3700 761 1019 2	3891 1168 1231 592
HDLAC10	692299	111	WUblastx.64	(Q9UBJ4) TRANSPOSASE-LIKE PROTEIN.	Q9UBJ4	99%	29	1378
HDPBA28	1062783	113	WUblastx.64	(Q9UKY2) ADIPOCYTE-DERIVED LEUCINE AMINOPEPTIDASE.	Q9UKY2	94%	259	3081
HDPBA28	866429	648	HMMER 2.1.1	PFAM: Peptidase family M1	PF01433	613.6	228	1391
			WUblastx.64	(Q9UKY2) ADIPOCYTE-DERIVED LEUCINE AMINOPEPTIDASE.	Q9UKY2	99%	69	2891
HDPBQ02	745403	649	WUblastx.64	(Q9H728) CDNA: FLJ21463 FIS, CLONE COL04765.	Q9H728	45% 60% 51% 61%	1667 2188 1741 2022	1548 2021 1643 1846
HDPBQ71	1160316	115	WUblastx.64	(Q9BRE2) HYPOTHETICAL 68.4 KDA PROTEIN (FRAGMENT).	Q9BRE2	100%	90	1928
HDPBQ71	727200	650	WUblastx.64	(Q9BRE2) HYPOTHETICAL 68.4 KDA PROTEIN	Q9BRE2	99%	21	1859

HDPBQ71	886067	651	WUblastx.64	(FRAGMENT). (Q9H2V9) CDA08.	Q9H2V9	100% 65% 44% 21% 93%	1532 169 182 1456 186	1999 264 322 1551 1541
HDP CY37	837699	117	HMMER 2.1.1	PFAM: Glycosyl hydrolase family 47	PF01532	627.5	199	1521
			WUblastx.64	(Q9H886) CDNA FLJ13869 FIS, CLONE THYRO1001287, WEAKLY SIMILAR TO MAN	Q9H886	92%	76	1809
HDP CY37	604114	652	HMMER 2.1.1	PFAM: Glycosyl hydrolase family 47	PF01532	324	199	834
HDPFF39	588697	118	WUblastx.64	(O96005) CLEFT LIP AND PALATE TRANSMEMBRANE PROTEIN 1.	O96005	100% 100%	3 97	29 762
HDPGK25	704067	119	WUblastx.64	(Q9H618) CDNA: FLJ22233 FIS, CLONE HRC02016.	Q9H618	98%	3	701
HDPGP94	823355	120	WUblastx.64	(Q14288) HYPOTHETICAL PROTEIN (FRAGMENT).	Q14288	50% 39% 55% 27% 27% 29%	689 1093 909 1804 1767 2282	216 890 700 1652 1090 2082
HDPJF37	704487	122	WUblastx.64	(Q9BSQ8) UNKNOWN (PROTEIN FOR IMAGE:3510191) (FRAGMENT).	Q9BSQ8	94% 36% 93%	105 158 19	650 718 153
HDPJM30	879325	123	WUblastx.64	(O94759) LONG TRANSIENT RECEPTOR POTENTIAL CHANNEL 2 (LTPC)	TRL2_HUM AN	99%	17	1633
HDPJM30	603517	653	WUblastx.64	(O94759) LONG TRANSIENT RECEPTOR POTENTIAL CHANNEL 2 (LTPC)	TRL2_HUM AN	89% 96% 98%	416 378 1	1312 530 378
HDPNC61	637585	124	WUblastx.64	(AAG23169) HC6.	AAG23169	52% 64%	654 37	827 78
HDPND46	637586	125	WUblastx.64	(Q9BR26) DJ257E24.3 (NOVEL PROTEIN) (FRAGMENT).	Q9BR26	98%	12	1466
HDP OE32	897276	126	WUblastx.64	(Q9BW48) MY047 PROTEIN.	Q9BW48	98%	64	345

HDPOH06	683371	127	HMMER 2.1.1	PFAM: Uncharacterized membrane protein family	PF01554	90.8	255	596
			WUblastx.64	(Q96FL8) Hypothetical 61.9 kDa protein.	Q96FL8	99%	18	977
HDPOZ56	815653	654	HMMER 2.1.1	PFAM: Flavin containing amine oxidase	PF01593	431.1	307	1614
			WUblastx.64	(Q96RQ9) Interleukin-4 induced gene-1 protein.	Q96RQ9	99%	103	1800
HDPOZ56	743479	655	HMMER 2.1.1	PFAM: Flavin containing amine oxidase	PF01593	185.2	200	949
HDPPA04	904765	129	HMMER 2.1.1	PFAM: Immunoglobulin domain	PF00047	19.1	373	582
			WUblastx.64	(Q9BQ51) BUTYROPHILIN PRECURSOR B7-DC (PD-1-LIGAND 2 PROTEIN).	Q9BQ51	92%	271	1089
HDPPH47	630030	130	WUblastx.64	(Q9NUN5) CDNA FLJ11240 FIS, CLONE PLACE1008568.	Q9NUN5	99%	116	1735
HDPSB18	1043263	131	WUblastx.64	(Q9H5R3) CDNA: FLJ23147 FIS, CLONE LNG09295.	Q9H5R3	70%	3363	3163
HDSP01	689129	661	WUblastx.64	(Q9BR97) UNKNOWN (PROTEIN FOR MGC:10763).	Q9BR97	90%	227	1114
						98%	1078	1668
						100%	1664	1744
HDPTD15	692917	135	WUblastx.64	(Q9BU29) UNKNOWN (PROTEIN FOR IMAGE:3954899) (FRAGMENT).	Q9BU29	97%	937	833
HDPTK41	744824	136	WUblastx.64	(BAB11849) MOP-2.	BAB11849	97% 99%	1013 72	1126 1025
HDPUG50	684120	137	WUblastx.64	(O60860) GLUCOSYLTRANSFERASE (FRAGMENT).	O60860	99%	4	1599
HDPUH26	866433	138	WUblastx.64	(Q9NXES) CDNA FLJ20296 FIS, CLONE HEP05890.	Q9NXE5	100%	735	1736
HDPUW68	812737	139	HMMER 2.1.1	PFAM: Immunoglobulin domain	PF00047	38.9	844	1005
			WUblastx.64	(Q9Y286) QA79 MEMBRANE PROTEIN, ALLELIC VARIANT AIRM-1B PRECURSOR.	Q9Y286	95%	70	1440
HDPVH60	796865	140	WUblastx.64	(BAB55096) CDNA FLJ14508 fis, clone NT2RM1000421, w	BAB55096	95% 54% 40% 25% 27% 29%	229 229 214 1137 981 987	294 294 294 1544 1622 1478



[illegible]

HE2DY70	722217	150	WUblastx.64		(Q9BS33) SIMILAR TO HYPOTHETICAL PROTEIN FLJ11218.	Q9BS33	72% 76% 100%	1186 1331 9	1121 1176 167
HE2FV03	396139	152	WUblastx.64		(CAD13327) BA382H24.3 (multiple PDZ domain protein)	CAD13327	73%	281	805
HE2NV57	740750	153	WUblastx.64		(Q9UGV6) BK445C9.3 (HIGH-MOBILITY GROUP (NONHISTONE CHROMOSOMAL) PROT	Q9UGV6	31% 66%	321 71	866 106
HE2PD49	638617	154	WUblastx.64		(Q9BSR6) SIMILAR TO RIKEN CDNA 2410018G23 GENE.	Q9BSR6	100%	403	849
HE8MH91	589450	157	WUblastx.64		(Q9H8Z4) CDNA FLJ13121 FIS, CLONE NT2RP3002687.	Q9H8Z4	98%	9	410
HE8QV67	1050076	158	WUblastx.64		(BAB55430) CDNA FLJ14978 fis, clone VESEN1000122.	BAB55430	100% 31% 100% 84% 74% 86%	321 487 1 1403 577 800	425 600 201 1684 729 1108
HE8UB86	834913	159	WUblastx.64		(Q9D390) 6330503C03RIK PROTEIN.	Q9D390	44% 61%	103 432	189 707
HE9BK23	675382	160	HMMER 2.1.1		PFAM: Fibrinogen beta and gamma chains, C-terminal globular domain	PF00147	77.2	762	959
			WUblastx.64		(Q9Y5C1) ANGIOPOIETIN 5.	Q9Y5C1	100% 98%	958 39	1419 959
HE9CO69	596829	161	WUblastx.64		(Q95772) H_NH1021A08.1 PROTEIN (UNKNOWN) (PROTEIN FOR MGC:14607) (SIM	Q95772	100%	25	291
HE9DG49	129935	163	WUblastx.64		(Q9NYL4) FK506 BINDING PROTEIN PRECURSOR.	Q9NYL4	93%	127	618
HE9DG49	658678	676	HMMER 2.1.1		PFAM: FKBP-type peptidyl-prolyl cis-trans isomerases	PF00254	91	211	492
			WUblastx.64		(Q9NYL4) FK506 BINDING PROTEIN PRECURSOR.	Q9NYL4	100%	70	672
HE9DG49	382000	677	HMMER 2.1.1		PFAM: FKBP-type peptidyl-prolyl cis-trans isomerases	PF00254	91	-71	-352
HE9OW20	838598	678	WUblastx.64		(CAC41349) Alpha2-glucosyltransferase.	CAC41349	99%	136	1059
HE9OW20	834400	679	blastx.2		potassium channel regulator 1 [Rattus norvegicus]	gb AAC3424 9.1	81% 90%	449 129	1051 497
HE9RM63	886167	165	WUblastx.64		(Q9NV86) CDNA FLJ10873 FIS, CLONE NT2RP4001730.	Q9NV86	40%	1995	2087

					WEAKLY SIMILAR TO UDP			100%	82	1113
HEAAR07	561524	166	WUblastx.64		probable transposase - human transposon MER37		pir S72481 S72481	57%	691	858
HEBCM63	484643	169	WUblastx.64		(Q9BYH1) SEZ6L.		Q9BYH1	91%	12	449
HEBEJ18	701802	170	WUblastx.64		(AAH00573) HSPC163 protein.		AAH00573	100%	51	467
HEEAG23	684254	171	HMMER 2.1.1		PFAM: emp24/gp25L/p24 family		PF01105	36.2	63	185
			WUblastx.64		(Q9CZL0) 2400003B06RIK PROTEIN.		Q9CZL0	59%	3	185
HEEAJ02	633657	172	WUblastx.64		(Q9BW86) PHOSPHATIDYLETHANOLAMINE N-METHYLTRANSFERASE.		Q9BW86	80%	406	780
HEEAQ11	777843	173	HMMER 2.1.1		PFAM: Cystatin domain		PF00031	99%	54	761
			WUblastx.64		(Q9H4G1) BA218C14.1 (NOVEL CYSTATIN FAMILY MEMBER).		Q9H4G1	39.7	360	638
HEGAN94	885637	174	WUblastx.64		colipase precursor, pancreatic - dog		pir A46717 A46717	87%	213	653
HEGAN94	769649	680	HMMER 2.1.1		PFAM: Colipase		PF01114	36%	148	393
			WUblastx.64		colipase precursor, pancreatic - dog		PF01114	24	229	405
HELKG31	681138	176	HMMER 2.1.1		PFAM: DHHC zinc finger domain		pir A46717 A46717	36%	229	474
			WUblastx.64		(Q9NPG8) CDNA FLJ10479 FIS, CLONE NT2RP2000120 (DC1) (HYPOTHETICAL 39		Q9NPG8	95.1	659	820
HELKG31	340352	682	HMMER 2.1.1		PFAM: DHHC zinc finger domain		PF01529	99%	209	1240
			blastx.2		CDNA FLJ10479 FIS, CLONE NT2RP2000120 (DC1).		sp Q9NPG8 Q9NPG8	95.1	-82	-243
								100%	498	1274
								98%	242	496

HELHD85	847372	177	WUblastx.64	(Q9N083) UNNAMED PORTEIN PRODUCT.	Q9N083	36%	36	128
HELHL48	696945	178	HMMER 2.1.1	PFAM: DHHC zinc finger domain	PF01529	124.3	797	991
			WUblastx.64	hypothetical protein DKFZp761E1347.1 - human (fragment)	pir T47144 T 47144	100%	359	1501
HELHL48	610025	683	HMMER 2.1.1	PFAM: DHHC zinc finger domain	PF01529	124.3	199	393
			WUblastx.64	hypothetical protein DKFZp761E1347.1 - human (fragment)	pir T47144 T 47144	100%	470	586
						99%	585	905
						100%	10	471
HEMAM4 1	741647	179	WUblastx.64	(AAH21428) Hypothetical 20.0 kDa protein.	AAH21428	67%	175	744
HEPAA46	596830	180	WUblastx.64	(Q96PH6) ESC42.	Q96PH6	100%	18	386
HEQCC55	884824	685	WUblastx.64	(Q9NP84) TYPE I TRANSMEMBRANE PROTEIN PRECURSOR (TYPE I TRANSMEMBRAN	Q9NP84	64%	62	397
HESAJ10	526013	185	WUblastx.64	(AAK95397) Selenoprotein SelM.	AAK95397	96%	566	841
						100%	477	545
						72%	550	582
HETAB45	609827	186	WUblastx.64	(Q9NXH2) CDNA FLJ20254 FIS, CLONE COLF6926.	Q9NXH2	98%	646	795
						99%	3	647
HETEU28	1018676	188	WUblastx.64	(Q96CP0) Similar to old astrocyte specifically induced substance.	Q96CP0	94%	7	714
HETLM70	1177512	189	WUblastx.64	(Q9H766) CDNA: FLJ21240 FIS, CLONE COL01132.	Q9H766	40%	3	989
HETLM70	1046327	688	blastx.2	B0416.1 gene product [Caenorhabditis elegans]	gb AAB3684 1.2	30%	231	977
HFABG18	847073	190	WUblastx.64	(Q9QZE9) TM6P1.	Q9QZE9	95%	53	253
						88%	237	797
HFABH95	566712	191	WUblastx.64	(Q9QZH5) PUTATIVE PHOSPHATE/PHOSPHOENOLPYRUVATE TRANSLOCATOR.	Q9QZH5	88%	513	944
						65%	9	77
HFAMB72	490697	192	WUblastx.64	(Q9Y6F6) JAW1-RELATED PROTEIN MRV11A LONG	Q9Y6F6	94%	672	722

HFCCQ50	579993	194	HMIMER 2.1.1		ISOFORM.		PF01762	69%	1	669
			WUblastx.64		PFAM: Galactosyltransferase			130.8	365	1042
HFCDK17	381980	195	WUblastx.64		(Q9C0J1) BETA-1,3-N- ACETYLGLUCOSAMINYLTRANSFERASE BGN-T4. (Q9H2Q4) HT027.		Q9C0J1	95%	35	1102
HFFAL36	560639	198	WUblastx.64		(O75525) T-STAR.		Q9H2Q4	80%	388	540
HFGAD82	513669	199	WUblastx.64		membrane glycoprotein M6 - mouse		O75525	97%	488	910
HFIIN69	1011487	200	WUblastx.64				pir I78556 I7 8556	100%	568	657
HFIIZ70	1043350	201	WUblastx.64		(Q9UI86) PRO0113. (AAK95397) Selenoprotein SelM.		Q9UI86	92%	249	410
							AAK95397	96%	102	182
								91%	423	458
HFKET18	889515	202	WUblastx.64		(Q9HAD8) CDNA FLJ11786 FIS, CLONE HEMBA1006036.		Q9HAD8	63%	1384	1485
								54%	1230	1397
								42%	1444	1533
								66%	1390	1434
								50%	1471	1533
HFFAO71	629193	207	WUblastx.64		(O60448) NEURONAL THREAD PROTEIN AD7C-NTP.		O60448	69%	1201	998
								60%	2034	1846
								60%	2009	1791
								53%	1223	1026
								40%	1223	1134
								32%	1786	1601
								44%	993	940
								59%	1059	934
								63%	2022	1789
								35%	2040	1708
								32%	1935	1690
								36%	1126	941
								44%	1141	932

[illegible]

HGBFO79	422794	224	WUblastx.64	(AAH06833) Similar to DKFZP586F1524 protein.	AAH06833	63% 46%	821 936	765 814
HGBIB74	837220	226	WUblastx.64	hypothetical protein ZK858.6 - Caenorhabditis elegans	pir T28058 T 28058	50% 51% 65% 62%	1387 2 482 723	1494 439 730 1403
HGBIB74	838602	701	blastx.2	Similar to S.cerevisiae EMP70 protein precursor (S25110) [Homo sapiens]	dbj BAA133 85.1	87% 100% 78% 88%	736 79 1251 537	1257 477 1505 749
HGBIB74	899864	702	blastx.2	Similar to S.cerevisiae EMP70 protein precursor (S25110) [Homo sapiens]	dbj BAA133 85.1	87%	12	950
HHAFAF20	838603	228	WUblastx.64	(Q9NXG9) CDNA FLJ20259 FIS, CLONE COLF7443 (HYPOTHETICAL 47.5 KDA PRO	Q9NXG9	87% 81%	540 245	728 580
HHEAA08	638231	229	WUblastx.64	(Q9BVD9) UNKNOWN (PROTEIN FOR MGC:5149).	Q9BVD9	61% 73%	1923 2123	1870 1923
HHEBB10	604124	230	WUblastx.64	(Q9NQRI) PR/SET DOMAIN CONTAINING PROTEIN 07.	Q9NQRI	95%	2	136
HHEMM7 4	941955	233	WUblastx.64	(Q96QU0) Calcium-promoted Ras inactivator.	Q96QU0	87%	1741	2046
HHEMM7 4	906815	704	blastx	unknown [Homo sapiens]	gb AAC5094 0.1	61% 53% 71%	830 713 731	738 636 711
HHENK42	493724	234	WUblastx.64	(AAK55521) PRO0764.	AAK55521	54%	644	441
HHENP27	799532	235	HMMER 2.1.1	PFAM: Immunoglobulin domain	PF00047	26.5	120	353
HHEPM33	877639	238	WUblastx.64	(Q96BF3) Hypothetical 30.7 kDa protein.	Q96BF3	99%	12	857
HHEPU04	838217	240	WUblastx.64	(Q96BH1) Ring finger protein 25.	Q96BH1	97% 100%	10 1185	1230 1373
HHEPU04	897457	707	blastx.2	(Q9BQB6) UNKNOWN (PROTEIN FOR MGC:11276) (PROTEIN FOR IMAGE:3455200). (BC000828) Unknown (protein for IMAGE:3455200) [Homo	Q9BQB6	100%	259	747
HHEPU04	897457	707	blastx.2	(BC000828) Unknown (protein for IMAGE:3455200) [Homo	gb AAH0082	80%	267	755

				sapiens]	8.1 AAH008 28			
HHEPU04	535730	708	WUblastx.64	(Q9BQB6) UNKNOWN (PROTEIN FOR MGC:11276) (PROTEIN FOR IMAGE:3455200).	Q9BQB6	72% 83% 100%	326 217 45	424 339 218
HHFEC49	905849	241	WUblastx.64	(Q9D1N2) 1110002J19RIK PROTEIN.	Q9D1N2	56%	180	500
HHFGR93	865581	242	WUblastx.64	(Q96AP7) Hypothetical 41.2 kDa protein.	Q96AP7	100%	132	1301
HHFGR93	691402	709	HMMER 2.1.1	PFAM: Immunoglobulin domain	PF00047	36.3	628	807
			WUblastx.64	(Q96AP7) Hypothetical 41.2 kDa protein.	Q96AP7	98% 99%	819 130	1298 828
HHFHR32	411470	244	WUblastx.64	(Q99LX9) SIMILAR TO SINGLE-STRANDED-DNA-BINDING PROTEIN.	Q99LX9	100%	1	762
HHFOJ29	1127491	245	WUblastx.64	(Q9H7P4) FLJ00024 PROTEIN (FRAGMENT).	Q9H7P4	99%	592	65
HHGCM76	662329	246	WUblastx.64	(Q96FV2) Unknown (protein for IMAGE:3945715) (Fragment).	Q96FV2	94% 98%	7 378	114 536
HHGCM76	383547	712	WUblastx.64	(Q96FV2) Unknown (protein for IMAGE:3945715) (Fragment).	Q96FV2	94% 98%	7 378	114 536
HHGDW4 3	554613	248	WUblastx.64	(Q9P1J1) PRO1546.	Q9P1J1	59% 52%	707 774	787 887
HHPGO40	129927	250	WUblastx.64	(Q9HBW1) Brain tumor associated protein NAG14.	Q9HBW1	74% 30%	191 338	976 928
HHPGO40	753270	713	HMMER 2.1.1	PFAM: Leucine Rich Repeat	PF00560	122	542	613
			WUblastx.64	(Q9HBW1) Brain tumor associated protein NAG14.	Q9HBW1	74% 30%	191 338	967 928
HHPGO40	560969	714	HMMER 2.1.1	PFAM: Leucine Rich Repeat	PF00560	77	548	619
HHSGW69	1031514	253	WUblastx.64	(O95325) PROTEASOME SUBUNIT P58.	O95325	100% 94%	730 529	780 582
HHTLF25	461438	254	WUblastx.64	(Q9UMT3) KILLER ACTIVATING RECEPTOR ASSOCIATED PROTEIN, ISOFORM B.	Q9UMT3	91%	142	474
HJABX32	487807	255	WUblastx.64	(O70277) RING FINGER PROTEIN.	O70277	98%	463	612



[illegible]

HKABZ65	862030	270	WUblastx.64	(Q96LB9) Peptidoglycan recognition protein-I-alpha precursor.	Q96LB9	90% 39%	77 137	802 541
HKABZ65	665424	726	WUblastx.64	(Q96LB9) Peptidoglycan recognition protein-I-alpha precursor.	Q96LB9	99% 45%	69 129	794 533
HKACB56	554616	271	HMMER 2.1.1	PFAM: Kazal-type serine protease inhibitor domain	PF00050	76.3	114	266
			WUblastx.64	(P01001) ACROSIN INHIBITORS IIA AND IIB (BUSI-II).	IAC2_BOVI N	82%	96	266
HKACD58	552465	727	WUblastx.64	(Q96BH2) Hypothetical 34.4 kDa protein.	Q96BH2	86% 87%	795 122	1208 724
HKACM93	1352383	273	blastx.14	aqualysin (EC 3.4.21.-) I precursor - Thermus aquaticus	pir A35742 A 35742	40% 41% 30% 50% 34% 53% 58%	884 1097 1274 746 548 425 2201	1039 1276 1468 823 670 469 2236
HKADQ91	604123	274	WUblastx.64	(Q9NWC5) HYPOTHETICAL 31.7 KDA PROTEIN.	Q9NWC5	100%	229	1053
HKAEG43	889521	275	WUblastx.64	(Q9NRD1) F-BOX PROTEIN FBG2.	Q9NRD1	100%	204	1082
HKAEL80	570865	276	WUblastx.64	(Q9H728) CDNA: FLJ21463 FIS, CLONE COL04765.	Q9H728	72% 75% 61%	935 1002 763	1000 1073 957
HKAEV06	638238	733	WUblastx.64	(Q9NVA4) CDNA FLJ10846 FIS, CLONE NT2RP4001373.	Q9NVA4	96% 100% 96%	367 197 480	459 367 1541
HKAFAK41	545018	278	WUblastx.64	(BAB55101) CDNA FLJ14515 fis, clone NT2RM1000800, w	BAB55101	91% 60%	18 130	371 537
HKDBF34	833065	279	WUblastx.64	(Q9HBJ8) KIDNEY-SPECIFIC MEMBRANE PROTEIN NX-17.	Q9HBJ8	88%	69	734
HKDBF34	587268	734	WUblastx.64	(Q9HBJ8) KIDNEY-SPECIFIC MEMBRANE PROTEIN NX-17.	Q9HBJ8	100% 96%	18 239	257 682
HKGAT94	762811	280	WUblastx.64	(Q9H919) CDNA FLJ13078 FIS, CLONE NT2RP3002002.	Q9H919	73% 80%	307 128	239 84

HKGAT94	460631	735	blastx.2	pva1 [Plasmodium vivax]	emb CAA63219.1	63%	228	121
HKISB57	625956	282	WUblastx.64	(AAL36150) Smoothelin-B3.	AAL36150	28% 100% 98% 27% 26% 44%	262 201 1107 271 532 954	582 1013 1256 480 966 1052
HKIYP40	580845	284	WUblastx.64	(Q9H7S6) CDNA FLJ14310 FIS, CLONE PLACE3000271.	Q9H7S6	47% 61% 77%	468 1098 1215	295 1036 1189
HKMLP68	1037919	286	WUblastx.64	(AAH17691) Hypothetical 61.8 kDa protein.	AAH17691	42%	8	586
HL2AC08	610018	287	HMMER 2.1.1	PFAM: Thioredoxin	PF00085	82.8	145	444
			WUblastx.64	hypothetical protein DKFZp564E1962.1 - human (fragment)	pir T12471 T12471	80%	46	903
HLCND09	1172046	289	HMMER 2.1.1	PFAM: PAP2 superfamily	PF01569	20.3	170	352
			WUblastx.64	(Q9H929) CDNA FLJ13055 FIS, CLONE NT2RP3001538, WEAKLY SIMILAR TO HYP	Q9H929	88%	107	421
HLCND09	1035153	739	HMMER 2.1.1	PFAM: PAP2 superfamily	PF01569	20.4	62	244
			blastx.2	(AK000307) unnamed protein product [Homo sapiens]	dbj BAA91072.1	50%	2	325
HLDBX13	815665	290	WUblastx.64	(Q9H387) PRO2550.	Q9H387	76% 60%	1764 1815	1681 1756
HLDOW79	847396	292	WUblastx.64	(Q90YM5) Organic solute transporter alpha.	Q90YM5	47%	10	672
HLDDQC46	847397	293	WUblastx.64	(Q9BXJ8) TRANSMEMBRANE PROTEIN INDUCED BY TUMOR NECROSIS FACTOR ALPHA	Q9BXJ8	100%	28	423
HLDDQR62	753742	294	WUblastx.64	(Q9NQW2) PROGRESSIVE ANKYLOSIS-LIKE PROTEIN.	Q9NQW2	100% 99%	41 376	382 1002
HLDDQU79	740755	295	WUblastx.64	(O75477) KE04P.	O75477	100%	105	1142

HLDRM43	846330	296	WUblastx.64	(Q96NZ9) Proline-rich acidic protein.	Q96NZ9	92%	24	476
HLDRM43	638939	740	WUblastx.64	(Q96NZ9) Proline-rich acidic protein.	Q96NZ9	100%	164	616
HLDRP33	647430	297	WUblastx.64	(Q9H743) CDNA: FLJ21394 FIS, CLONE COL03536.	Q9H743	38%	340	278
HLHFP03	460467	298	WUblastx.64	(Q9WVC2) LY-6/NEUROTOXIN HOMOLOG (ADULT MALE HIPPOCAMPUS CDNA, RIKEN	Q9WVC2	64%	599	489
HLICQ90	791828	301	WUblastx.64	(Q96N65) CDNA FLJ131349 fis, clone MESAN2000092, moderately similar to	Q96N65	81%	224	571
HLJBj61	1019012	302	WUblastx.64	deoxyhypusine synthase (EC 1.1.1.249) [validated] - human	pir S68692 S68692	95%	571	636
HLQDR48	519349	304	WUblastx.64	(Q9NX17) CDNA FLJ20489 FIS, CLONE KAT08285.	Q9NX17	93%	59	616
HLQBE09	520375	305	WUblastx.64	second peroxisomal thioesterase - human	pir JC7367 JC7367	93%	805	1047
HLQDH79	588446	306	WUblastx.64	(Q9HBZ6) HT005 PROTEIN.	Q9HBZ6	75%	783	649
HLQDR48	1307726	307	WUblastx.64	(Q9NQZ1) HEPATOCELLULAR CARCINOMA ASSOCIATED PROTEIN TD26.	Q9NQZ1	56%	8	559
HLQDR48	619979	745	WUblastx.64	(Q9NQZ1) HEPATOCELLULAR CARCINOMA ASSOCIATED PROTEIN TD26.	Q9NQZ1	100%	404	556
HLQEM64	897823	746	WUblastx.64	(Q9NVB5) CDNA FLJ10829 FIS, CLONE NT2RP4001138.	Q9NVB5	86%	296	406
HLTAU74	853614	309	WUblastx.64	(AAH21123) Hypothetical 113.9 kDa protein (Fragment	AAH21123	83%	289	399
HLTCO33	778074	310	WUblastx.64	(Q96MM0) CDNA FLJ32172 fis, clone PLACE6000555.	Q96MM0	99%	3	437
HLTHG37	787530	314	WUblastx.64	(AAH01258) N-acetylglucosamine-phosphate mutase.	AAH01258	93%	6	704
HLWAA17	629552	315	WUblastx.64	(Q9NY26) IRT1 PROTEIN (SIMILAR TO ZINC/IRON REGULATED TRANSPORTER-LIK	Q9NY26	37%	6	803
HLWAD77	653513	316	WUblastx.64	(Q9GZP9) F-LAN-1 (HYPOTHETICAL TRANSMEMBRANE PROTEIN SBB153).	Q9GZP9	72%	982	917
HLWAE11	783071	317	HMMER 2.1.1	PFAM: C1q domain	PF00386	62%	1179	973
			WUblastx.64	(Q9BX19) COMPLEMENT-C1Q TUMOR NECROSIS FACTOR-RELATED PROTEIN.	Q9BX19	100%	960	1070
						93%	2	955
						99%	85	960
						99%	29	745
						44.4	403	789
						99%	28	861

HLWAO22	587270	318	WUblastx.64	(Q9NRG9) GL003 (ADRACALIN) (AAAS PROTEIN) (UNKNOWN) (PROTEIN FOR MGC:	Q9NRG9	78% 28% 97% 100% 83% 30% 41% 28% 26% 58%	449 139 1003 14 19 396 503 100 470 333	1147 420 1263 40 495 596 664 408 859 503
HLWAY54	658702	319	WUblastx.64	(Q9BY87) PROACROSIN BINDING PROTEIN SP32 PRECURSOR.	Q9BY87	78% 100% 100% 23% 37% 80%	38 1448 1251 1445 1260 1006	1006 1663 1448 1594 1331 1326
HLWBY76	797609	321	WUblastx.64	(AAH06651) Similar to hypothetical protein FLJ23153	AAH06651	76%	6	1127
HLYAN59	553507	748	WUblastx.64	(Q9P529) Hypothetical 15.2 kDa protein.	Q9P529	93% 96% 90% 96% 96% 92% 76% 89% 96% 100%	631 638 631 638 638 638 620 638 638 638	720 721 720 721 721 721 721 721 721 721
HLYAZ61	423998	749	HMMER 2.1.1	PFAM: 7 transmembrane receptor (rhodopsin family)	PF00001	71.8	254	-309
			WUblastx.64	(O14626) PROBABLE G PROTEIN-COUPLED RECEPTOR H963.	H963_HUM AN	98%	1	846
HMADS41	596831	328	WUblastx.64	(AAH07725) Ceroid-lipofuscinosis, neuronal 8 (epile	AAH07725	92% 100%	186 427	449 1041

HMADU73	467053	750	WUblastx.64	(Q9EPE8) LOW-DENSITY LIPOPROTEIN RECEPTOR-RELATED PROTEIN 9.	Q9EPE8	78%	115	294
HMAMI15	1352406	330	blastx.14	(Q96QY4) BA134O15.1 (similar to citrate lyase) (Fragment).	Q96QY4	99%	85	1023
HMAMI15	1049263	751	WUblastx.64	(Q96QY4) BA134O15.1 (similar to citrate lyase) (Fragment).	Q96QY4	79% 100%	372 84	920 440
HMDAE65	520338	331	WUblastx.64	(Q9NLE3) PROBABLE (HHV-6) U1102, VARIANT A DNA, COMPLETE VIRION GENOM	Q9NLE3	79% 70% 63% 64% 67%	335 342 333 330 333	249 250 235 235 250
HMECK83	636035	335	WUblastx.64	(O62658) LINE-1 ELEMENT ORF2.	O62658	32% 50% 49%	668 65 483	483 6 100
HMEED18	560775	336	WUblastx.64	(Q9H651) CDNA: FLJ22604 FIS, CLONE HSI04630 (BBP-LIKE PROTEIN 2).	Q9H651	93%	34	696
HMEET96	566720	337	WUblastx.64	(Q9CR48) 2610318G18RIK PROTEIN.	Q9CR48	86%	121	915
HMIAL37	603201	338	HMMER 2.1.1	PFAM: PDZ domain (Also known as DHR or GLGF).	PF00595	57.7	127	327
			WUblastx.64	(Q9Y6N9) ANTIGEN NY-CO-38.	Q9Y6N9	100% 100% 38% 27% 35% 62% 63%	315 76 109 870 765 1111 1067	1100 315 318 1061 998 1242 1132
HMIAP86	726831	339	HMMER 2.1.1	PFAM: Mitochondrial carrier proteins	PF00153	262	329	1180
			WUblastx.64	(AAG29582) Mitochondrial uncoupling protein 5 long	AAG29582	97%	182	1183
HMMAH6 0	562776	341	WUblastx.64	(Q9H728) CDNA: FLJ21463 FIS, CLONE COL04765.	Q9H728	52% 53%	675 820	538 665
HMQDT36	1309723	343	WUblastx.64	(Q9D1Q6) 1110001E24RIK PROTEIN.	Q9D1Q6	89%	157	1350
HMQDT36	424085	753	HMMER 2.1.1	PFAM: Thioredoxin	PF00085	59.8	76	-265

				WUblastx.64	(Q9D1Q6) I110001E24RIK PROTEIN.	Q9D1Q6	93%	192	1409
HMSBX80	597448	344		WUblastx.64	(Q9H728) CDNA: FLJ21463 FIS, CLONE COL04765.	Q9H728	61%	1721	1413
HMSG14	570833	346		WUblastx.64	(Q9BGV8) HYPOTHETICAL 10.0 KDA PROTEIN.	Q9BGV8	73%	403	615
HMSGU01	1049069	347		WUblastx.64	(Q9H8U5) CDNA FLJ13219 FIS, CLONE NT2RP4001849, WEAKLY SIMILAR TO SH3	Q9H8U5	59%	418	840
HMSGU01	1158803	754		WUblastx.64	(Q9H8U5) CDNA FLJ13219 FIS, CLONE NT2RP4001849, WEAKLY SIMILAR TO SH3	Q9H8U5	45% 82%	217 221	657 838
HMSGU01	853368	755		WUblastx.64	(Q9H8U5) CDNA FLJ13219 FIS, CLONE NT2RP4001849, WEAKLY SIMILAR TO SH3	Q9H8U5	100%	215	838
HMSHS36	1127691	349		WUblastx.64	(Q95662) POT. ORF VI (FRAGMENT).	Q95662	83%	781	350
HMSHS36	1028961	756		blastx.2	pot. ORF VI [Homo sapiens]	emb CAA26920.1	61% 77%	539 609	378 490
HMSKC04	799540	352		WUblastx.64	(Q9H743) CDNA: FLJ21394 FIS, CLONE COL03536.	Q9H743	66% 60% 56%	1341 1414 1244	1225 1346 1053
HMTAD67	588447	353		WUblastx.64	(Q9N083) UNNAMED PORTEIN PRODUCT.	Q9N083	64%	1171	947
HMUAP70	872208	354		WUblastx.64	(Q9EQH8) NEDD4 WW DOMAIN-BINDING PROTEIN 5 (FRAGMENT).	Q9EQH8	89%	69	845
HMUAP70	778820	758		WUblastx.64	(Q9BT67) UNKNOWN (PROTEIN FOR MGC:10924).	Q9BT67	100% 72% 100%	183 229 338	221 402 844
HMUAP70	381964	761		blastx.2	(AF220209) Nedd4 WW domain-binding protein 5 [Mus musculus]	gb AAG44248.1	86%	1	720
HMWEB0 2	638159	356		WUblastx.64	(Q96MX0) CDNA FLJ31762 fis, clone NT2RI2007754, weakly similar to INT	Q96MX0	100% 34% 97%	10 187 333	207 300 479
HMWFO0 2	542061	762		WUblastx.64	(Q9P1C6) PRO2738.	Q9P1C6	61% 44%	647 473	549 345
HMWFFY1 0	825421	358		WUblastx.64	(Q9NYF4) PUTATIVE ZINC FINGER PROTEIN.	Q9NYF4	98%	14	226
HMWFFY1 0	490495	763		WUblastx.64	(Q9NYF4) PUTATIVE ZINC FINGER PROTEIN.	Q9NYF4	98%	14	226
HMWGY6	1308287	359		WUblastx.64	(Q9D624) 1200003C23RIK PROTEIN.	Q9D624	55%	42	1442

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HNHOD46	843488	395	WUblastx.64	(O60448) NEURONAL THREAD PROTEIN AD7C-NTP.	O60448	76% 56% 56% 52% 73% 59% 50% 70% 48% 50% 35% 31% 50% 61%	334 646 645 844 331 353 828 721 781 558 401 283 379 486	552 921 713 894 498 625 917 792 915 791 595 552 462 839
HNTBL27	545534	397	WUblastx.64	(Q96AA3) Putative endoplasmic reticulum multispan transmembrane prote	Q96AA3	98% 33% 40% 96%	243 13 646 13	500 168 711 261
HNTCE26	1160395	398	HMMER 2.1.1	PFAM: 7 transmembrane receptor (rhodopsin family)	PF00001	137.5	282	1037
			WUblastx.64	(Q9H1Y3) DJ317G22.2 (ENCEPHALOPSIN) (PANOPSIN).	Q9H1Y3	100%	111	1316
HNTCE26	853373	774	HMMER 2.1.1	PFAM: 7 transmembrane receptor (rhodopsin family)	PF00001	23.2	63	218
			WUblastx.64	(Q9H1Y3) DJ317G22.2 (ENCEPHALOPSIN) (PANOPSIN).	Q9H1Y3	95% 100%	370 12	495 377
HOACB38	520201	401	WUblastx.64	(Q9H387) PRO2550.	Q9H387	71% 77%	420 589	295 419
HODDN65	520348	403	WUblastx.64	(Q9N083) UNNAMED PORTEIN PRODUCT.	Q9N083	74% 67%	743 660	663 493
HODDN92	422913	404	WUblastx.64	(Q9H1S5) BA110H4.2 (SIMILAR TO MEMBRANE PROTEIN).	Q9H1S5	100%	1119	1021
HODDO08	790333	405	WUblastx.64	(AAL55740) Hypothetical 11.9 kDa protein.	AAL55740	100%	725	1042
HODDW4	579256	406	WUblastx.64	(Q9NX85) CDNA FLJ20378 FIS, CLONE KAlA0536.	Q9NX85	59%	677	495



HOF0C33	1186156	419	WUblastx.64	clusterin precursor - dog	pir A40018 A 40018	69% 81%	1022 115	1414 1086
HOF0C33	967554	788	HMMER 2.1.1	PFAM: Clusterin	PF01093	236.4	81	395
			WUblastx.64	clusterin precursor - dog	pir A40018 A 40018	65%	120	449
HOF0C33	878690	789	HMMER 2.1.1	PFAM: Clusterin	PF01093	236.6	81	395
HOF0C33	905734	790	HMMER 2.1.1	PFAM: Clusterin	PF01093	301.2	76	432
			blastx.2	glycoprotein 80 [Canis familiaris]	gb AAA3084 6.1	81% 69% 81%	440 1023 115	1087 1415 432
HOF0C33	806819	793	HMMER 2.1.1	PFAM: 60s Acidic ribosomal protein	PF00428	74.6	-422	-733
			WUblastx.64	acidic ribosomal protein P0, cytosolic [validated] - human	pir A27125 R 5HUP0	52% 87%	5 42	55 812
HOGCK20	745445	420	WUblastx.64	(Q969N2) Phosphatidyl inositol glycan class T precursor (Hypothetical	Q969N2	99% 97%	378 57	1622 389
HOGCK63	895880	421	WUblastx.64	(Q9Y386) CGI-78 PROTEIN.	Q9Y386	69% 88% 92%	1214 1161 514	1252 1214 1161
HOGCK63	902295	795	WUblastx.64	(Q96BI3) Hypothetical 29.0 kDa protein.	Q96BI3	100% 96%	813 22	872 477
HOGCS52	919898	422	WUblastx.64	(Q9NY68) CTL2 PROTEIN.	Q9NY68	90%	79	1383
HOHBB49	833080	423	WUblastx.64	(Q96MM0) CDNA FLJ32172 fis, clone PLACE6000555.	Q96MM0	57%	2582	2292
HOHBC68	603968	424	WUblastx.64	(AAH20256) Hypothetical 110.4 kDa protein.	AAH20256	94% 97%	348 676	707 1785
HOHCH55	827481	427	WUblastx.64	(O95965) TEN INTEGRIN EGF-LIKE REPEAT DOMAINS PROTEIN PRECURSOR.	O95965	84%	221	1702
HOHCH55	815682	798	blastx.2	(AF072752) ten integrin EGF-like repeat domains protein precursor [Homo sapiens]	gb AAD1766 6.1	99% 42% 35%	230 326 416	1621 1426 1576

HOSDJ25	854234	428	WUblastx.64	(Q9D8Y9) 1810018L05RIK PROTEIN.	Q9D8Y9	100%	1623	1712
HOSEG51	545809	429	WUblastx.64	(Q9NUT5) CDNA FLJ11152 FIS, CLONE PLACE1006901 (FRAGMENT).	Q9NUT5	85% 86%	468 143	593 544
HOSEQ49	58824	430	WUblastx.64	(Q9UP47) TNF-INDUCED PROTEIN GG2-1.	Q9UP47	51% 100%	2 46	82 537
HOSFD58	614040	431	HMMER 2.1.1	PFAM: ATP-sulfonylase	PF01747	99% 697.3	120 -335	683 -
			WUblastx.64	3'-phosphoadenosine-5'-phosphosulfate synthetase - human	pirJW0087  W0087	100%	56	1321 1927
HOUQC17	429229	432	HMMER 2.1.1	PFAM: Reprolysin family propeptide	PF01562	76.2	216	-20
			WUblastx.64	(P97857) ADAM-TS 1 PRECURSOR (EC 3.4.24.-) (A DISINTEGRIN A	ATS1_MOU SE	81%	508	3408
HOUDK26	565393	433	WUblastx.64	(Q9NUX1) CDNA FLJ11082 FIS, CLONE PLACE1005206.	Q9NUX1	94%	4	585
HOUGG12	775824	802	WUblastx.64	(Q9H2K4) DM4E3.	Q9H2K4	94% 41% 28% 27% 33% 28% 100% 22%	619 688 536 619 649 778 413 649	1290 1437 703 1194 1266 1269 616 1212
HPASA81	900548	803	HMMER 2.1.1	PFAM: CUB domain	PF00431	146.9	452	778
			WUblastx.64	(Q35360) UTERUS-OVARY SPECIFIC PUTATIVE TRANSMEMBRANE PROTEIN.	O35360	70% 75%	8 918	928 1814
HPASA81	801923	804	blastx.2	(AF022147) uterus-ovary specific putative transmembrane protein [Rattus norvegicus]	gb AAB7189 5.1	69% 60% 33% 40%	299 106 641 1009	1924 333 934 1119
HPBCU51	411080	437	WUblastx.64	(Q9BWJ9) SIMILAR TO NEUROBLASTOMA (NERVE TISSUE) PROTEIN.	Q9BWJ9	96%	56	154

HPFCL43	535710	440	WUblastx.64	(AAH07349) Adrenal gland protein AD-004.	AAH07349	97%	57	257
HPFDG48	542227	441	WUblastx.64	(Q9Y6E5) HSPC024-ISO.	Q9Y6E5	90%	564	623
						88%	313	387
HPIAQ68	833082	442	WUblastx.64	(Q95LL4) Hypothetical 13.9 kDa protein.	Q95LL4	46%	905	1174
HPIBO15	1310868	443	WUblastx.64	(Q9CQS3) 1110018M03RIK PROTEIN.	Q9CQS3	93%	128	757
HPIBO15	590741	807	WUblastx.64	(Q9CQS3) 1110018M03RIK PROTEIN.	Q9CQS3	88%	127	402
						95%	507	722
						97%	401	508
HPJCL22	1146674	445	WUblastx.64	(Q9GKV3) HYPOTHETICAL 41.8 KDA PROTEIN.	Q9GKV3	92%	1540	2508
						75%	2701	2823
HPJCL22	1034817	811	blastx.2	cDNA EST EMBL:M89462 comes from this gene; cDNA EST 1	emb CAA943	44%	534	896
				1 yk349d7.5 comes from this gene; cDNA EST yk358b9.5 comes	01.1	29%	94	345
				from this				
HPJCL22	1046434	812	blastx.2	(AK000385) unnamed protein product [Homo sapiens]	dbj BAA911	71%	705	568
					31.1	66%	743	702
HPJCW04	589969	446	WUblastx.64	(Q9N083) UNNAMED PORTEIN PRODUCT.	Q9N083	45%	1275	1144
						54%	1450	1265
HPMAI22	635491	448	WUblastx.64	(Q9CX19) 9430073N08RIK PROTEIN.	Q9CX19	65%	147	629
HPQAC69	396804	451	WUblastx.64	(O75592) PROTEIN ASSOCIATED WITH MYC.	O75592	100%	202	297
						28%	76	189
						100%	3	200
HPRBC80	829136	452	HMMER 2.1.1	PFAM: Protein phosphatase 2C	PF00481	336.4	157	957
			WUblastx.64	(Q9HAY8) SER/THR PROTEIN PHOSPHATASE TYPE 2C	Q9HAY8	97%	94	1254
				BETA 2 ISOFORM (PROTEIN				
HPRSB76	526310	453	WUblastx.64	(AAK33100) Aminophospholipid-transporting ATPase.	AAK33100	38%	2	364
						92%	112	570
HPWDI42	722246	457	WUblastx.64	(Q9H728) CDNA: FLJ21463 FIS, CLONE COL04765.	Q9H728	64%	1100	1026
						67%	1332	1102
HPZAB47	585702	458	WUblastx.64	hypothetical protein 3 - human	pir E41925 E	34%	1132	884
					41925	55%	1296	1183
HRAAB15	658717	459	WUblastx.64	(Q9BVS2) UNKNOWN (PROTEIN FOR IMAGE:3451448)	Q9BVS2	40%	14	511
				(FRAGMENT).				

HRABA80	882176	460	WUblastx.64	(Q9HA75) CDNA FLJ12122 FIS, CLONE MAMMA1000129.	Q9HA75	63% 68%	221 325	310 459
HRABA80	588460	822	WUblastx.64	(Q9HA75) CDNA FLJ12122 FIS, CLONE MAMMA1000129.	Q9HA75	63% 48% 92%	633 130 233	665 357 493
HRACD15	871221	461	WUblastx.64	(AAH08084) Hypothetical 50.4 kDa protein.	AAH08084	98%	1452	253
HRACD80	1309774	462	WUblastx.64	(CAC37630) Fibulin-6 (Fragment).	CAC37630	44% 36% 45% 42% 47%	700 37 1282 1291 1291	1866 1446 1920 1584 1530
HRACD80	882163	824	HMMER 2.1.1	PFAM: EGF-like domain	PF00008	64.3	1337	1441
			WUblastx.64	(CAC37630) Fibulin-6 (Fragment).	CAC37630	44% 37% 45% 42% 47% 28% 33%	695 32 1277 1286 1286 1839 285	1861 1441 1915 1579 1525 1913 440
HRACD80	740762	825	blastx.2	(AF135253) fibulin-2 [Mus musculus]	gb AAD3445 6.1	33% 31% 45% 49% 44% 30% 43% 31% 43% 35% 41% 42% 41%	898 1279 1279 681 898 901 928 802 699 690 928 699 699	1581 1893 1608 911 1125 1605 1149 1137 899 998 1119 911 908

[illegible]

1050



HSSJC35	1306937	498	WUblastx.64	(Q9H400) DJ583P15.4.1 (NOVEL PROTEIN (TRANSLATION OF CDNA FLJ20406 (E	Q9H400	81%	62	946
HSSJC35	745409	840	WUblastx.64	(Q9H400) DJ583P15.4.1 (NOVEL PROTEIN (TRANSLATION OF CDNA FLJ20406 (E	Q9H400	100%	55	939
HSUBW09	413246	500	WUblastx.64	(Q95LL0) Hypothetical 11.3 kDa protein.	Q95LL0	73%	589	633
HSVBU91	596868	502	WUblastx.64	cytoplasmic linker protein CLIP-115 - rat	pir T42734 T42734	77%	327	611
HSXCG83	944388	503	WUblastx.64	(Q9H7F4) CDNA: FLJ20979 FIS, CLONE ADSU01938.	Q9H7F4	85%	356	171
HSXCG83	830673	842	blastx.2	(AL117204) Y116A8C.9 [Caenorhabditis elegans]	emb CAB55145.1	99%	101	901
HSYAV50	847358	506	HMMER 2.1.1	PFAM: Leucine Rich Repeat	PF00560	36%	10	657
			WUblastx.64	(Q96CX1) Similar to RIKEN cDNA 2610528G05 gene (Fragment).	Q96CX1	97.9	383	454
HSYAZ63	1177537	509	WUblastx.64	(Q9Y613) FH1/FH2 DOMAINS-CONTAINING PROTEIN (FORMIN HOMOLOG	FHOS_HUMAN	96%	371	2170
						98%	478	1713
						96%	2573	2941
						93%	2101	2514
						55%	272	544
						33%	790	933
						33%	2030	2119
						92%	3007	3090
						28%	1015	1458
						28%	289	654
						42%	608	670
						56%	2005	2052
						41%	2220	2321
						41%	2142	2255
						37%	2098	2184
						36%	2916	3005
						42%	2913	2990
						33%	2946	3026
						69%	1756	1794

HSYAZ63	862063	848	WUblastx.64	(Q9Y613) FHL1/FH2 DOMAINS-CONTAINING PROTEIN (FORMIN HOMOLOG	PHOS_HUMAN	78% 33% 92% 100% 96% 69% 47% 36% 52% 32%	458 387 1364 14 930 113 558 561 362 455	871 476 1447 70 1298 151 620 707 418 601
HSYBG37	1056317	510	WUblastx.64	hypothetical protein c316G12.3 [imported] - human	pir T45062 T45062	100%	122	961
HSYBG37	581098	849	WUblastx.64	hypothetical protein c316G12.3 [imported] - human	pir T45062 T45062	100%	48	962
HSZAF47	456551	850	HMMER 2.1.1	PFAM: Collagen triple helix repeat (20 copies)	PF01391	54.4	299	478
			WUblastx.64	(Q9BX12) COMPLEMENT-C1Q TUMOR NECROSIS FACTOR-RELATED PROTEIN.	Q9BX12	88% 62% 58% 50% 57%	500 107 344 344 353	976 397 394 397 394
HT3SF53	884170	512	WUblastx.64	(Q9H5B4) DJ470L14.2.1 (STAUFEN (RNA BINDING PROTEIN) ISOFORM 1).	Q9H5B4	100%	312	533
HT5GJ57	1299921	513	WUblastx.64	(Q9GZY6) CDNA FLJ11237 FIS, CLONE PLACE1008531 (WBSCR5) (WBSCR15 PROT	Q9GZY6	89%	105	833
HT5GJ57	740767	851	WUblastx.64	(Q9NZY9) HSPC046.	Q9NZY9	90% 70%	754 122	1002 799
HTADX17	753289	514	WUblastx.64	(Q96A28) CD84-H1 (CD2 FAMILY 10).	Q96A28	93% 79%	92 408	412 959
HTADX17	457172	852	WUblastx.64	(Q96A28) CD84-H1 (CD2 FAMILY 10).	Q96A28	78% 97% 99%	490 548 84	585 952 488
HTDAF28	396835	515	WUblastx.64	(Q9BX79) STRA6 ISOFORM 1.	Q9BX79	98%	17	298

HTEAF65	866485	516	WUblastx.64	(Q9DAC0) 1700013004RIK PROTEIN.	Q9DAC0	44%	9	287
HTEBI28	462221	517	WUblastx.64	(Q95LJ0) Epididymis-specific protein ESP13.6.	Q95LJ0	46%	43	231
HTEDF80	587326	518	WUblastx.64	(Q9NP89) HYPOTHETICAL 42.7 KDA PROTEIN (FRAGMENT).	Q9NP89	100%	253	327
						30%	1016	1135
						100%	852	1073
						75%	112	210
						98%	698	856
						91%	353	451
						66%	450	863
HTEDY42	519372	853	HMMER 2.1.1	PFAM: SCP-like extracellular protein	PF00188	20	-98	-193
			WUblastx.64	(Q96L06) Similar to RIKEN cDNA 1700011E04 gene.	Q96L06	100%	19	231
						33%	576	719
						94%	224	700
HTEGI42	908143	521	WUblastx.64	(AAH20905) Hypothetical 28.5 kDa protein.	AAH20905	88%	41	796
HTEHR24	835894	522	WUblastx.64	(Q9HBV2) SPERM MEMBRANE ANTIGEN SMARC32.	Q9HBV2	76%	84	959
HTEHR24	513039	858	WUblastx.64	(Q9HBV2) SPERM MEMBRANE ANTIGEN SMARC32.	Q9HBV2	76%	41	529
						100%	692	922
						96%	514	693
HTEHU31	600394	523	WUblastx.64	(Q9NPE6) DJ309K20.2 (ACROSOMAL PROTEIN ACR55 (SIMILAR TO RAT SPERM AN	Q9NPE6	97%	16	1056
HTEHU93	722254	524	WUblastx.64	(O60676) CYSTATIN-RELATED EPIDIDYMAL SPERMATOGENIC PROTEIN	CRES_HUM AN	91%	188	613
HTEHU93	423009	859	HMMER 2.1.1	PFAM: Cystatin domain	PF00031	31.7	35	-105
			WUblastx.64	(O60676) CYSTATIN-RELATED EPIDIDYMAL SPERMATOGENIC PROTEIN	CRES_HUM AN	100%	504	614
						78%	187	552
HTEJN13	658744	860	WUblastx.64	(Q9DAR9) 1700001D09RIK PROTEIN.	Q9DAR9	60%	525	743
						77%	163	516
HTEPG70	834931	529	WUblastx.64	(O75295) R27328_2.	O75295	93%	23	268
HTGAU75	597467	530	WUblastx.64	(Q9NZX5) HSPC062.	Q9NZX5	55%	502	672
						72%	149	661
HTGEP89	410582	531	WUblastx.64	(Q9DAL9) 1700007K09RIK PROTEIN.	Q9DAL9	44%	258	566

HTHBG43	919911	532	WUblastx.64	(Q9H387) PRO2550.	Q9H387	83% 70%	772 702	701 571
HTHDJ94	693652	534	HMMER 2.1.1	PFAM: Oxidoreductase FAD/NAD-binding domain	PF00175	160.3	552	896
			WUblastx.64	(Q9UHQ9) NADH-CYTOCHROME B5 REDUCTASE ISOFORM.	Q9UHQ9	95%	66	941
HTHDS25	772559	535	WUblastx.64	(Q9PIH3) PRO1438.	Q9PIH3	66%	1045	911
HTJMA95	706618	536	HMMER 2.1.1	PFAM: Ammonium Transporter Family	PF00909	62.1	533	691
			WUblastx.64	(Q9UBD6) RH TYPE C GLYCOPROTEIN (TUMOR- RELATED PROTEIN DRC2).	Q9UBD6	98% 100%	3 449	455 1069
HTJML75	1040047	537	WUblastx.64	(Q9UIX6) ANAPHASE-PROMOTING COMPLEX SUBUNIT 2.	Q9UIX6	94%	30	2495
HTJML75	873355	864	WUblastx.64	(Q9UIX6) ANAPHASE-PROMOTING COMPLEX SUBUNIT 2.	Q9UIX6	78% 94% 89%	40 423 911	423 1016 2503
HTLBE23	902187	538	WUblastx.64	(Q96M29) CDNA FLJ32871 fis, clone TESTI2003914, weakly similar to Tek	Q96M29	98% 93% 81%	176 840 1112	838 980 1177
HTLFE42	460583	539	WUblastx.64	(Q9NSI0) PRED58 PROTEIN (FRAGMENT).	Q9NSI0	99%	17	346
HTLFE57	791409	866	WUblastx.64	(Q9D7G6) 2310009N03RIK PROTEIN.	Q9D7G6	90%	12	698
HTLFE57	608317	867	WUblastx.64	(Q9D7G6) 2310009N03RIK PROTEIN.	Q9D7G6	84%	2	619
HTLGE31	1035130	541	WUblastx.64	(Q9NY64) GLUCOSE TRANSPORTER.	Q9NY64	100%	3	92
HTLHY14	838460	542	WUblastx.64	(Q96L02) Hypothetical 24.5 kDa protein.	Q96L02	99% 100%	36 528	434 773
HTLIT32	833906	543	WUblastx.64	(Q96QH1) NB1 Glycoprotein precursor.	Q96QH1	32% 29%	312 330	932 1007
HTLIV19	1046341	544	WUblastx.64	(Q96LS9) CDNA FLJ25101 fis, clone CBR01328.	Q96LS9	73%	193	315
HTODK73	526021	547	WUblastx.64	(Q9H8P2) CDNA FLJ13348 FIS, CLONE OVARC1002127, WEAKLY SIMILAR TO SOD	Q9H8P2	93% 100% 71% 43% 61%	404 567 433 4 418	448 707 474 189 519

HTOHHM15	1028538	551	WUblastx.64	(Q9NVL9) CDNA FLJ10649 FIS, CLONE NT2RP2005835, WEAKLY SIMILAR TO SHP	Q9NVL9	80%	21	401
HTOHHM15	848200	870	HMMER 2.1.1	PFAM: UBX domain	PF00789	97.6	794	1033
HTOJA73	797108	554	WUblastx.64	(Q9H387) PRO2550.	Q9H387	63%	1044	955
HTOJK60	545067	555	WUblastx.64	(Q9HA67) CDNA FLJ12155 FIS, CLONE MAMMA1000472.	Q9HA67	66%	1294	1046
HTPBW79	1317835	556	WUblastx.64	(Q9CXR7) 3110023E09RIK PROTEIN.	Q9CXR7	73%	745	644
HTPBW79	581435	873	WUblastx.64	(Q9S93) Hypothetical 41.7 kDa protein.	Q9S93	78%	870	757
HTTDB46	812763	559	WUblastx.64	(Q9Y2C7) BUTYROPHILIN LIKE RECEPTOR.	Q9Y2C7	77%	172	813
HTTDB46	909573	875	HMMER 2.1.1	PFAM: SPRY domain	PF00622	92%	787	999
HTWCT03	429618	560	WUblastx.64	(Q95014) WUGSC:H_DJ0855D21.2 PROTEIN.	Q95014	95%	302	1387
HTWDF76	714344	561	WUblastx.64	(Q9BTF2) REC8P, A MEIOTIC RECOMBINATION AND SISTER CHROMATID COHESION	Q9BTF2	70%	106	543
HTXDW56	695765	565	WUblastx.64	(Q96A54) Similar to CGI-45 protein (Hypothetical 42.6 kDa protein).	Q96A54	83%	727	762
HTXFL30	620001	566	WUblastx.64	(Q96KR5) Leishmanolysin-like peptidase, variant 2 (EC 3.4.24.36).	Q96KR5	59%	1007	1072
						100%	1644	2180
						65.9	-956	-
						82%	1488	1592
						100%	792	875
						92%	370	510
						27%	7	498
						35%	179	238
						37%	379	525
						79%	542	688
						70%	179	280
						76%	4	192
						99%	7	819
						98%	305	1990
						100%	30	68
						100%	213	299
						100%	68	94

HTXKP61	824083	567	WUblastx.64	(Q9H0S8) HYPOTHETICAL 53.0 KDA PROTEIN.	Q9H0S8	98%	3	1124
HUDBZ89	562791	877	WUblastx.64	(Q9VH80) CG16908 PROTEIN.	Q9VH80	22%	7	327
HUFEF62	645101	570	WUblastx.64	hypothetical L1 protein (third intron of gene TS) - human	pir JU0033 U0033	81%	355	308
HUKAH51	1300737	880	WUblastx.64	(Q9ES75) PROLINE-RICH ACIDIC PROTEIN.	Q9ES75	84%	314	12
HUKAH51	603538	881	WUblastx.64	(Q96NZ9) Proline-rich acidic protein.	Q96NZ9	50%	144	563
HUKBT29	694590	572	WUblastx.64	(Q96AA2) Obscurin.	Q96AA2	100%	462	479
HUSAT94	606599	573	WUblastx.64	(Q96LS9) CDNA FLJ25101 fis, clone CBR01328.	Q96LS9	93%	55	462
HUSBA88	895435	574	HMMER 2.1.1	PFAM: Glycosyl hydrolase family 47	PF01532	82%	131	1300
HUSIG64	566762	575	WUblastx.64	(Q9UKM7) ALPHA 1,2-MANNOSIDASE.	Q9UKM7	30%	520	597
HUSXS50	883176	882	WUblastx.64	(O60763) GENERAL VESICULAR TRANSPORT FACTOR P115 (TRANSCYTO	VDP_HUMAN	33%	500	571
HUSXS50	655372	883	WUblastx.64	(AAH08361) F-box only protein 7.	AAH08361	29%	152	370
HWAAD6 <sub>3</sub>	838626	577	HMMER 2.1.1	(AAH08361) F-box only protein 7.	AAH08361	100%	1039	1338
HWAAD6 <sub>3</sub>	833089	884	WUblastx.64	PFAM: Sodium/calcium exchanger protein	PF01699	34%	597	710
			HMMER 2.1.1	(Q9HC58) SODIUM/CALCIUM EXCHANGER NCKX3.	Q9HC58	28%	134	316
			HMMER 2.1.1	PFAM: Sodium/calcium exchanger protein	PF01699	60%	1865	1752
						73%	1752	1573
						694	783	2102
						100%	18	2114
						99%	9	1010
						99%	281	1069
						42%	1566	1622
						100%	1067	1666
						77%	1	459
						26%	43	219
						100%	317	700
						62.8	346	453
						65%	229	813
						37.8	346	453

				blastx.2	(AF177984) potassium-dependent sodium-calcium exchanger NCKX1 [Gallus gallus]	gb AAAF2580 8.1 AF17798 4_1	45%	217	453
HWAAD6 3	793875	885		HMMER 2.1.1	PFAM: Sodium/calcium exchanger protein	PF01699	113.7	336	773
				blastx.2	(AF025664) Na-Ca+K exchanger [Bos taurus]	gb AAB8888 4.1	43%	207	785
HWABY10	768334	579		WUblastx.64	(Q96AW1) Hypothetical 19.2 kDa protein.	Q96AW1	100%	165	665
HWBAO62	838164	581		HMMER 2.1.1	PFAM: Immunoglobulin domain	PF00047	27.9	202	402
				WUblastx.64	(Q14288) HYPOTHETICAL PROTEIN (FRAGMENT).	Q14288	45%	1331	1618
							66%	1158	1334
							62%	1847	1894
							55%	1594	1839
HWBAR14	1107118	582		WUblastx.64	(AAK54386) Prostein.	AAK54386	80%	1737	2426
							84%	290	1033
HWBAR88	836469	583		WUblastx.64	(Q9Y2C2) DERMATAN/CHONDROITIN SULFATE 2-SULFOTRANSFERASE.	Q9Y2C2	83%	958	1050
							64%	107	241
							88%	215	982
HWBCB89	1093347	584		WUblastx.64	(BAB55294) CDNA FLJ14777 fis, clone NT2RP4000259, w	BAB55294	100%	94	576
HWBCB89	886210	890		HMMER 2.1.1	PFAM: Glutathione peroxidases	PF00255	170.2	104	433
				WUblastx.64	(BAB55294) CDNA FLJ14777 fis, clone NT2RP4000259, w	BAB55294	100%	35	595
HWBCP79	846382	585		WUblastx.64	(AAH20829) Hypothetical 6.2 kDa protein.	AAH20829	78%	134	93
							78%	72	16
HWBCP79	646977	891		WUblastx.64	(Q96MM0) CDNA FLJ32172 fis, clone PLACE6000555.	Q96MM0	27%	330	133
							85%	148	68
HWBEM1 8	949402	587		WUblastx.64	nuclear pore protein gp210 precursor - rat	pir S04921 S 04921	83%	159	5735
HWBEM1 8	906580	893		blastx.2	gp210 (AA 1-1886) [Rattus norvegicus]	emb CAA687 59.1	87%	131	2629
							79%	2626	3570
							31%	2595	2732

HWBEM1 8	877573	894	WUblastx.64	hypothetical protein DKFZp434P1650.1 - human (fragment)	pir T17289 T 17289	96%	205	1494
HWBF57	907063	588	WUblastx.64	(Q9NR73) MACROPHAGE ABC TRANSPORTER.	Q9NR73	78%	206	1048
HWD4H3 8	1028519	590	WUblastx.64	(Q9NX85) CDNA FLJ20378 FIS, CLONE KAIJA0536.	Q9NX85	69%	1113	1250
						63%	979	1119
						81%	947	979
						52%	1534	1340
HWHGP71	995431	591	HMMER 2.1.1	PFAM: 7 transmembrane receptor (rhodopsin family)	PF00001	60%	1602	1528
			WUblastx.64	leukotriene B4 receptor 2, BLTR2 - human	pir JC7356 J C7356	31.2	389	766
						94%	101	766
						35%	487	591
						47%	434	484
						84%	715	1020
HWHGP71	839250	899	blastx.2	(AJ278605) leukotriene B4 receptor 2 [Homo sapiens]	emb CAB961 34.1	77%	106	465
						100%	555	770
HWHGQ4 9	636080	900	WUblastx.64	(Q9Y5B4) ANDROGEN INDUCED PROTEIN.	Q9Y5B4	58%	776	1036
HWHGU5 4	695695	593	HMMER 2.1.1	PFAM: Serpins (serine protease inhibitors)	PF00079	99%	42	755
						501.1	277	1377
			WUblastx.64	(Q9CQ32) 4632419J12RIK PROTEIN.	Q9CQ32	61%	145	1383
HWHGZ51	886212	594	WUblastx.64	(Q9UJ74) HYPOTHETICAL 36.0 KDA PROTEIN (C4.4A PROTEIN).	Q9UJ74	86%	33	1022
HWHHL34	805642	595	WUblastx.64	(O75915) JWA PROTEIN (HSPC127) (VITAMIN A RESPONSIVE, CYTOSKELETON RE	O75915	100%	131	694
HWHHL34	801943	901	blastx.2	(AF070523) JWA protein [Homo sapiens]	gb AAC6436 0.1	92%	53	613
HWHQ55	762842	596	HMMER 2.1.1	PFAM: Cadherin domain	PF00028	224.2	907	1182
			WUblastx.64	(AAK51616) Protocadherin-beta.10.	AAK51616	99%	169	1800
						30%	535	1785
						80%	1817	2563



HWLEV32	1032602	597	WUblastx.64	(Q63778) HYPOTHETICAL 43.7 KDA PROTEIN.	Q63778	28%	520	1632
						54%	142	20
						40%	400	239
						38%	419	342
						48%	684	535
HWLEV32	846351	905	WUblastx.64	(Q9W6Q6) OSTEOLAST 6D12C PROTEIN.	Q9W6Q6	88%	143	421
HWLIH65	793713	598	HMMER 2.1.1	PFAM: Integral membrane protein	PF01940	49.3	147	455
			WUblastx.64	(AAH08596) Unknown (protein for MGC:16985).	AAH08596	98%	81	623
HYAAJ71	826754	599	WUblastx.64	(Q9NX17) CDNA FLJ20489 FIS, CLONE KAT08285.	Q9NX17	62%	1147	1464
HAPSA79	846517	602	HMMER 2.1.1	PFAM: Immunoglobulin domain	PF00047	67	924	1130
			WUblastx.64	(Q9BX67) JUNCTIONAL ADHESION MOLECULE 3 PRECURSOR.	Q9BX67	100%	468	1397
HAPSA79	887467	906	HMMER 2.1.1	PFAM: Immunoglobulin domain	PF00047	67	924	1130
			blastx.2	(AF356518) junctional adhesion molecule 3 precursor [Homo sapiens]	gb AAK27221.1 AF356518_1	92%	540	1397
HAPSA79	878627	907	HMMER 2.1.1	PFAM: Immunoglobulin domain	PF00047	67	924	1130
			WUblastx.64	(Q9BX67) JUNCTIONAL ADHESION MOLECULE 3 PRECURSOR.	Q9BX67	100%	468	1397

***RACE Protocol For Recovery of Full-Length Genes***

Partial cDNA clones can be made full-length by utilizing the rapid amplification of cDNA ends (RACE) procedure described in Frohman, M.A., et al., Proc. Nat'l. Acad. Sci. USA, 85:8998-9002 (1988). A cDNA clone missing either the 5' or 3' end can be reconstructed to include the absent base pairs extending to the translational start or stop codon, respectively. In some cases, cDNAs are missing the start codon of translation, therefor. The following briefly describes a modification of this original 5' RACE procedure. Poly A+ or total RNA is reverse transcribed with Superscript II (Gibco/BRL) and an antisense or complementary primer specific to the cDNA sequence. The primer is removed from the reaction with a Microcon Concentrator (Amicon). The first-strand cDNA is then tailed with dATP and terminal deoxynucleotide transferase (Gibco/BRL). Thus, an anchor sequence is produced which is needed for PCR amplification. The second strand is synthesized from the dA-tail in PCR buffer, Taq DNA polymerase (Perkin-Elmer Cetus), an oligo-dT primer containing three adjacent restriction sites (XhoI, SalI and ClaI) at the 5' end and a primer containing just these restriction sites. This double-stranded cDNA is PCR amplified for 40 cycles with the same primers as well as a nested cDNA-specific antisense primer. The PCR products are size-separated on an ethidium bromide-agarose gel and the region of gel containing cDNA products the predicted size of missing protein-coding DNA is removed. cDNA is purified from the agarose with the Magic PCR Prep kit (Promega), restriction digested with XhoI or SalI, and ligated to a plasmid such as pBluescript SKII (Stratagene) at XhoI and EcoRV sites. This DNA is transformed into bacteria and the plasmid clones sequenced to identify the correct protein-coding inserts. Correct 5' ends are confirmed by comparing this sequence with the putatively identified homologue and overlap with the partial cDNA clone. Similar methods known in the art and/or commercial kits are used to amplify and recover 3' ends.

Several quality-controlled kits are commercially available for purchase. Similar reagents and methods to those above are supplied in kit form from Gibco/BRL for both 5' and 3' RACE for recovery of full length genes. A second kit is available from Clontech which is a modification of a related technique, SLIC (single-stranded ligation to single-stranded cDNA), developed by Dumas et al., Nucleic Acids Res., 19:5227-32 (1991). The major differences in procedure are that the RNA is alkaline hydrolyzed after reverse transcription and RNA ligase is used to join a restriction site-containing anchor primer to the first-strand cDNA. This obviates the necessity for the dA-tailing reaction which results in a polyT stretch that is difficult to sequence past.

An alternative to generating 5' or 3' cDNA from RNA is to use cDNA library double-stranded DNA. An asymmetric PCR-amplified antisense cDNA strand is synthesized with an antisense cDNA-specific primer and a plasmid-anchored primer. These primers are removed and a

symmetric PCR reaction is performed with a nested cDNA-specific antisense primer and the plasmid-anchored primer.

***RNA Ligase Protocol For Generating The 5' or 3' End Sequences To Obtain Full Length Genes***

5           Once a gene of interest is identified, several methods are available for the identification of the 5' or 3' portions of the gene which may not be present in the original cDNA plasmid. These methods include, but are not limited to, filter probing, clone enrichment using specific probes and protocols similar and identical to 5' and 3' RACE. While the full length gene may be present in the library and can be identified by probing, a useful method for generating the 5' or 3' end is to use the  
10   existing sequence information from the original cDNA to generate the missing information. A method similar to 5' RACE is available for generating the missing 5' end of a desired full-length gene. (This method was published by Fromont-Racine et al., Nucleic Acids Res., 21(7):1683-1684 (1993)). Briefly, a specific RNA oligonucleotide is ligated to the 5' ends of a population of RNA presumably containing full-length gene RNA transcript and a primer set containing a primer specific  
15   to the ligated RNA oligonucleotide and a primer specific to a known sequence of the gene of interest, is used to PCR amplify the 5' portion of the desired full length gene which may then be sequenced and used to generate the full length gene. This method starts with total RNA isolated from the desired source, poly A RNA may be used but is not a prerequisite for this procedure. The RNA preparation may then be treated with phosphatase if necessary to eliminate 5' phosphate  
20   groups on degraded or damaged RNA which may interfere with the later RNA ligase step. The phosphatase if used is then inactivated and the RNA is treated with tobacco acid pyrophosphatase in order to remove the cap structure present at the 5' ends of messenger RNAs. This reaction leaves a 5' phosphate group at the 5' end of the cap cleaved RNA which can then be ligated to an RNA oligonucleotide using T4 RNA ligase. This modified RNA preparation can then be used as a  
25   template for first strand cDNA synthesis using a gene specific oligonucleotide. The first strand synthesis reaction can then be used as a template for PCR amplification of the desired 5' end using a primer specific to the ligated RNA oligonucleotide and a primer specific to the known sequence of the gene of interest. The resultant product is then sequenced and analyzed to confirm that the 5' end sequence belongs to the relevant gene.

30           The present invention also relates to vectors or plasmids which include such DNA sequences, as well as the use of the DNA sequences. The material deposited with the ATCC (e.g., as described in columns 2 and 3 of Table 1A, and/or as set forth in Table 1B, Table 6, or Table 7) is a mixture of cDNA clones derived from a variety of human tissue and cloned in either a plasmid vector or a phage vector, as described, for example, in Table 1A and Table 7. These deposits are  
35   referred to as "the deposits" herein. The tissues from which some of the clones were derived are listed in Table 7, and the vector in which the corresponding cDNA is contained is also indicated in

Table 7. The deposited material includes cDNA clones corresponding to SEQ ID NO:X described, for example, in Table 1A and/or Table 1B (ATCC Deposit No:Z). A clone which is isolatable from the ATCC Deposits by use of a sequence listed as SEQ ID NO:X, may include the entire coding region of a human gene or in other cases such clone may include a substantial portion of the coding region of a human gene. Furthermore, although the sequence listing may in some instances list only a portion of the DNA sequence in a clone included in the ATCC Deposits, it is well within the ability of one skilled in the art to sequence the DNA included in a clone contained in the ATCC Deposits by use of a sequence (or portion thereof) described in, for example Tables 1A and/or Table 1B or Table 2, by procedures hereinafter further described, and others apparent to those skilled in the art.

Also provided in Table 1A and Table 7 is the name of the vector which contains the cDNA clone. Each vector is routinely used in the art. The following additional information is provided for convenience.

Vectors Lambda Zap (U.S. Patent Nos. 5,128,256 and 5,286,636), Uni-Zap XR (U.S. Patent Nos. 5,128, 256 and 5,286,636), Zap Express (U.S. Patent Nos. 5,128,256 and 5,286,636), pBluescript (pBS) (Short, J. M. et al., *Nucleic Acids Res.* 16:7583-7600 (1988); Alting-Mees, M. A. and Short, J. M., *Nucleic Acids Res.* 17:9494 (1989)) and pBK (Alting-Mees, M. A. et al., *Strategies* 5:58-61 (1992)) are commercially available from Stratagene Cloning Systems, Inc., 11011 N. Torrey Pines Road, La Jolla, CA, 92037. pBS contains an ampicillin resistance gene and pBK contains a neomycin resistance gene. Phagemid pBS may be excised from the Lambda Zap and Uni-Zap XR vectors, and phagemid pBK may be excised from the Zap Express vector. Both phagemids may be transformed into *E. coli* strain XL-1 Blue, also available from Stratagene.

Vectors pSport1, pCMVSPORT 1.0, pCMVSPORT 2.0 and pCMVSPORT 3.0, were obtained from Life Technologies, Inc., P. O. Box 6009, Gaithersburg, MD 20897. All Sport vectors contain an ampicillin resistance gene and may be transformed into *E. coli* strain DH10B, also available from Life Technologies. See, for instance, Gruber, C. E., et al., *Focus* 15:59- (1993). Vector lafmid BA (Bento Soares, Columbia University, New York, NY) contains an ampicillin resistance gene and can be transformed into *E. coli* strain XL-1 Blue. Vector pCR<sup>®</sup>2.1, which is available from Invitrogen, 1600 Faraday Avenue, Carlsbad, CA 92008, contains an ampicillin resistance gene and may be transformed into *E. coli* strain DH10B, available from Life Technologies. See, for instance, Clark, J. M., *Nuc. Acids Res.* 16:9677-9686 (1988) and Mead, D. et al., *Bio/Technology* 9: (1991).

The present invention also relates to the genes corresponding to SEQ ID NO:X, SEQ ID NO:Y, and/or the deposited clone (ATCC Deposit No:Z). The corresponding gene can be isolated in accordance with known methods using the sequence information disclosed herein. Such methods include preparing probes or primers from the disclosed sequence and identifying or amplifying the corresponding gene from appropriate sources of genomic material.

Also provided in the present invention are allelic variants, orthologs, and/or species homologs. Procedures known in the art can be used to obtain full-length genes, allelic variants, splice variants, full-length coding portions, orthologs, and/or species homologs of genes corresponding to SEQ ID NO:X or the complement thereof, polypeptides encoded by genes  
5 corresponding to SEQ ID NO:X or the complement thereof, and/or the cDNA contained in ATCC Deposit No:Z, using information from the sequences disclosed herein or the clones deposited with the ATCC. For example, allelic variants and/or species homologs may be isolated and identified by making suitable probes or primers from the sequences provided herein and screening a suitable nucleic acid source for allelic variants and/or the desired homologue.

10 The polypeptides of the invention can be prepared in any suitable manner. Such polypeptides include isolated naturally occurring polypeptides, recombinantly produced polypeptides, synthetically produced polypeptides, or polypeptides produced by a combination of these methods. Means for preparing such polypeptides are well understood in the art.

15 The polypeptides may be in the form of the secreted protein, including the mature form, or may be a part of a larger protein, such as a fusion protein (see below). It is often advantageous to include an additional amino acid sequence which contains secretory or leader sequences, pro-sequences, sequences which aid in purification, such as multiple histidine residues, or an additional sequence for stability during recombinant production.

20 The polypeptides of the present invention are preferably provided in an isolated form, and preferably are substantially purified. A recombinantly produced version of a polypeptide, including the secreted polypeptide, can be substantially purified using techniques described herein or otherwise known in the art, such as, for example, by the one-step method described in Smith and Johnson, Gene 67:31-40 (1988). Polypeptides of the invention also can be purified from natural, synthetic or recombinant sources using techniques described herein or otherwise known in the art,  
25 such as, for example, antibodies of the invention raised against the polypeptides of the present invention in methods which are well known in the art.

The present invention provides a polynucleotide comprising, or alternatively consisting of, the nucleic acid sequence of SEQ ID NO:X, and/or the cDNA sequence contained in ATCC Deposit No:Z. The present invention also provides a polypeptide comprising, or alternatively,  
30 consisting of, the polypeptide sequence of SEQ ID NO:Y, a polypeptide encoded by SEQ ID NO:X or a complement thereof, a polypeptide encoded by the cDNA contained in ATCC Deposit No:Z, and/or the polypeptide sequence encoded by a nucleotide sequence in SEQ ID NO:B as defined in column 6 of Table 1C. Polynucleotides encoding a polypeptide comprising, or alternatively consisting of the polypeptide sequence of SEQ ID NO:Y, a polypeptide encoded by SEQ ID NO:X,  
35 a polypeptide encoded by the cDNA contained in ATCC Deposit No:Z, and/or a polypeptide sequence encoded by a nucleotide sequence in SEQ ID NO:B as defined in column 6 of Table 1C

are also encompassed by the invention. The present invention further encompasses a polynucleotide comprising, or alternatively consisting of, the complement of the nucleic acid sequence of SEQ ID NO:X, a nucleic acid sequence encoding a polypeptide encoded by the complement of the nucleic acid sequence of SEQ ID NO:X, and/or the cDNA contained in ATCC Deposit No:Z.

5           Moreover, representative examples of polynucleotides of the invention comprise, or alternatively consist of, one, two, three, four, five, six, seven, eight, nine, ten, or more of the sequences delineated in Table 1C column 6, or any combination thereof. Additional, representative examples of polynucleotides of the invention comprise, or alternatively consist of, one, two, three, four, five, six, seven, eight, nine, ten, or more of the complementary strand(s) of the sequences  
10       delineated in Table 1C column 6, or any combination thereof. In further embodiments, the above-described polynucleotides of the invention comprise, or alternatively consist of, sequences delineated in Table 1C, column 6, and have a nucleic acid sequence which is different from that of the BAC fragment having the sequence disclosed in SEQ ID NO:B (see Table 1C, column 5). In additional embodiments, the above-described polynucleotides of the invention comprise, or  
15       alternatively consist of, sequences delineated in Table 1C, column 6, and have a nucleic acid sequence which is different from that published for the BAC clone identified as BAC ID NO:A (see Table 1C, column 4). In additional embodiments, the above-described polynucleotides of the invention comprise, or alternatively consist of, sequences delineated in Table 1C, column 6, and have a nucleic acid sequence which is different from that contained in the BAC clone identified as  
20       BAC ID NO:A (see Table 1C, column 4). Polypeptides encoded by these polynucleotides, other polynucleotides that encode these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention. Additionally, fragments and variants of the above-described polynucleotides and polypeptides are also encompassed by the invention.

          Further, representative examples of polynucleotides of the invention comprise, or  
25       alternatively consist of, one, two, three, four, five, six, seven, eight, nine, ten, or more of the sequences delineated in column 6 of Table 1C which correspond to the same Clone ID (see Table 1C, column 1), or any combination thereof. Additional, representative examples of polynucleotides of the invention comprise, or alternatively consist of, one, two, three, four, five, six, seven, eight, nine, ten, or more of the complementary strand(s) of the sequences delineated in column 6 of Table  
30       1C which correspond to the same Clone ID (see Table 1C, column 1), or any combination thereof. In further embodiments, the above-described polynucleotides of the invention comprise, or alternatively consist of, sequences delineated in column 6 of Table 1C which correspond to the same Clone ID (see Table 1C, column 1) and have a nucleic acid sequence which is different from that of the BAC fragment having the sequence disclosed in SEQ ID NO:B (see Table 1C, column 5). In  
35       additional embodiments, the above-described polynucleotides of the invention comprise, or alternatively consist of, sequences delineated in column 6 of Table 1C which correspond to the same

Clone ID (see Table 1C, column 1) and have a nucleic acid sequence which is different from that published for the BAC clone identified as BAC ID NO:A (see Table 1C, column 4). In additional embodiments, the above-described polynucleotides of the invention comprise, or alternatively consist of, sequences delineated in column 6 of Table 1C which correspond to the same Clone ID  
5 (see Table 1C, column 1) and have a nucleic acid sequence which is different from that contained in the BAC clone identified as BAC ID NO:A (see Table 1C, column 4). Polypeptides encoded by these polynucleotides, other polynucleotides that encode these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention. Additionally, fragments and variants of the above-described polynucleotides and polypeptides are also encompassed by the  
10 invention.

Further, representative examples of polynucleotides of the invention comprise, or alternatively consist of, one, two, three, four, five, six, seven, eight, nine, ten, or more of the sequences delineated in column 6 of Table 1C which correspond to the same contig sequence identifier SEQ ID NO:X (see Table 1C, column 2), or any combination thereof. Additional,  
15 representative examples of polynucleotides of the invention comprise, or alternatively consist of, one, two, three, four, five, six, seven, eight, nine, ten, or more of the complementary strand(s) of the sequences delineated in column 6 of Table 1C which correspond to the same contig sequence identifier SEQ ID NO:X (see Table 1C, column 2), or any combination thereof. In further embodiments, the above-described polynucleotides of the invention comprise, or alternatively  
20 consist of, sequences delineated in column 6 of Table 1C which correspond to the same contig sequence identifier SEQ ID NO:X (see Table 1C, column 2) and have a nucleic acid sequence which is different from that of the BAC fragment having the sequence disclosed in SEQ ID NO:B (see Table 1C, column 5). In additional embodiments, the above-described polynucleotides of the invention comprise, or alternatively consist of, sequences delineated in column 6 of Table 1C which  
25 correspond to the same contig sequence identifier SEQ ID NO:X (see Table 1C, column 2) and have a nucleic acid sequence which is different from that published for the BAC clone identified as BAC ID NO:A (see Table 1C, column 4). In additional embodiments, the above-described polynucleotides of the invention comprise, or alternatively consist of, sequences delineated in column 6 of Table 1C which correspond to the same contig sequence identifier SEQ ID NO:X (see  
30 Table 1C, column 2) and have a nucleic acid sequence which is different from that contained in the BAC clone identified as BAC ID NO:A (See Table 1C, column 4). Polypeptides encoded by these polynucleotides, other polynucleotides that encode these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention. Additionally, fragments and variants of the above-described polynucleotides and polypeptides are also encompassed by the invention.

35 Moreover, representative examples of polynucleotides of the invention comprise, or alternatively consist of, one, two, three, four, five, six, seven, eight, nine, ten, or more of the

sequences delineated in the same row of Table 1C column 6, or any combination thereof. Additional, representative examples of polynucleotides of the invention comprise, or alternatively consist of, one, two, three, four, five, six, seven, eight, nine, ten, or more of the complementary strand(s) of the sequences delineated in the same row of Table 1C column 6, or any combination thereof. In preferred embodiments, the polynucleotides of the invention comprise, or alternatively consist of, one, two, three, four, five, six, seven, eight, nine, ten, or more of the complementary strand(s) of the sequences delineated in the same row of Table 1C column 6, wherein sequentially delineated sequences in the table (i.e. corresponding to those exons located closest to each other) are directly contiguous in a 5' to 3' orientation. In further embodiments, above-described polynucleotides of the invention comprise, or alternatively consist of, sequences delineated in the same row of Table 1C, column 6, and have a nucleic acid sequence which is different from that of the BAC fragment having the sequence disclosed in SEQ ID NO:B (see Table 1C, column 5). In additional embodiments, the above-described polynucleotides of the invention comprise, or alternatively consist of, sequences delineated in the same row of Table 1C, column 6, and have a nucleic acid sequence which is different from that published for the BAC clone identified as BAC ID NO:A (see Table 1C, column 4). In additional embodiments, the above-described polynucleotides of the invention comprise, or alternatively consist of, sequences delineated in the same row of Table 1C, column 6, and have a nucleic acid sequence which is different from that contained in the BAC clone identified as BAC ID NO:A (see Table 1C, column 4). Polypeptides encoded by these polynucleotides, other polynucleotides that encode these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention.

In additional specific embodiments, polynucleotides of the invention comprise, or alternatively consist of, one, two, three, four, five, six, seven, eight, nine, ten, or more of the sequences delineated in column 6 of Table 1C, and the polynucleotide sequence of SEQ ID NO:X (e.g., as defined in Table 1C, column 2) or fragments or variants thereof. Polypeptides encoded by these polynucleotides, other polynucleotides that encode these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention.

In additional specific embodiments, polynucleotides of the invention comprise, or alternatively consist of, one, two, three, four, five, six, seven, eight, nine, ten, or more of the sequences delineated in column 6 of Table 1C which correspond to the same Clone ID (see Table 1C, column 1), and the polynucleotide sequence of SEQ ID NO:X (e.g., as defined in Table 1A, Table 1B, or Table 1C) or fragments or variants thereof. In preferred embodiments, the delineated sequence(s) and polynucleotide sequence of SEQ ID NO:X correspond to the same Clone ID. Polypeptides encoded by these polynucleotides, other polynucleotides that encode these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention.



In further specific embodiments, polynucleotides of the invention comprise, or alternatively consist of, one, two, three, four, five, six, seven, eight, nine, ten, or more of the sequences delineated in the same row of column 6 of Table 1C, and the polynucleotide sequence of SEQ ID NO:X (e.g., as defined in Table 1A, Table 1B, or Table 1C) or fragments or variants thereof. In preferred embodiments, the delineated sequence(s) and polynucleotide sequence of SEQ ID NO:X correspond to the same row of column 6 of Table 1C. Polypeptides encoded by these polynucleotides, other polynucleotides that encode these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention.

In additional specific embodiments, polynucleotides of the invention comprise, or alternatively consist of a polynucleotide sequence in which the 3' 10 polynucleotides of one of the sequences delineated in column 6 of Table 1C and the 5' 10 polynucleotides of the sequence of SEQ ID NO:X are directly contiguous. Nucleic acids which hybridize to the complement of these 20 contiguous polynucleotides under stringent hybridization conditions or alternatively, under lower stringency conditions, are also encompassed by the invention. Polypeptides encoded by these polynucleotides and/or nucleic acids, other polynucleotides and/or nucleic acids that encode these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention. Additionally, fragments and variants of the above-described polynucleotides, nucleic acids, and polypeptides are also encompassed by the invention.

In additional specific embodiments, polynucleotides of the invention comprise, or alternatively consist of, a polynucleotide sequence in which the 3' 10 polynucleotides of one of the sequences delineated in column 6 of Table 1C and the 5' 10 polynucleotides of a fragment or variant of the sequence of SEQ ID NO:X are directly contiguous. Nucleic acids which hybridize to the complement of these 20 contiguous polynucleotides under stringent hybridization conditions or alternatively, under lower stringency conditions, are also encompassed by the invention. Polypeptides encoded by these polynucleotides and/or nucleic acids, other polynucleotides and/or nucleic acids encoding these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention. Additionally, fragments and variants of the above-described polynucleotides, nucleic acids, and polypeptides are also encompassed by the invention.

In specific embodiments, polynucleotides of the invention comprise, or alternatively consist of, a polynucleotide sequence in which the 3' 10 polynucleotides of the sequence of SEQ ID NO:X and the 5' 10 polynucleotides of the sequence of one of the sequences delineated in column 6 of Table 1C are directly contiguous. Nucleic acids which hybridize to the complement of these 20 contiguous polynucleotides under stringent hybridization conditions or alternatively, under lower stringency conditions, are also encompassed by the invention. Polypeptides encoded by these polynucleotides and/or nucleic acids, other polynucleotides and/or nucleic acids encoding these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention.

Additionally, fragments and variants of the above-described polynucleotides, nucleic acids, and polypeptides are also encompassed by the invention.

In specific embodiments, polynucleotides of the invention comprise, or alternatively consist of, a polynucleotide sequence in which the 3' 10 polynucleotides of a fragment or variant of the sequence of SEQ ID NO:X and the 5' 10 polynucleotides of the sequence of one of the sequences delineated in column 6 of Table 1C are directly contiguous. Nucleic acids which hybridize to the complement of these 20 contiguous polynucleotides under stringent hybridization conditions or alternatively, under lower stringency conditions, are also encompassed by the invention. Polypeptides encoded by these polynucleotides and/or nucleic acids, other polynucleotides and/or nucleic acids encoding these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention. Additionally, fragments and variants of the above-described polynucleotides, nucleic acids, and polypeptides, are also encompassed by the invention.

In further specific embodiments, polynucleotides of the invention comprise, or alternatively consist of, a polynucleotide sequence in which the 3' 10 polynucleotides of one of the sequences delineated in column 6 of Table 1C and the 5' 10 polynucleotides of another sequence in column 6 are directly contiguous. Nucleic acids which hybridize to the complement of these 20 contiguous polynucleotides under stringent hybridization conditions or alternatively, under lower stringency conditions, are also encompassed by the invention. Polypeptides encoded by these polynucleotides and/or nucleic acids, other polynucleotides and/or nucleic acids encoding these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention. Additionally, fragments and variants of the above-described polynucleotides, nucleic acids, and polypeptides are also encompassed by the invention.

In specific embodiments, polynucleotides of the invention comprise, or alternatively consist of, a polynucleotide sequence in which the 3' 10 polynucleotides of one of the sequences delineated in column 6 of Table 1C and the 5' 10 polynucleotides of another sequence in column 6 corresponding to the same Clone ID (see Table 1C, column 1) are directly contiguous. Nucleic acids which hybridize to the complement of these 20 lower stringency conditions, are also encompassed by the invention. Polypeptides encoded by these polynucleotides and/or nucleic acids, other polynucleotides and/or nucleic acids encoding these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention. Additionally, fragments and variants of the above-described polynucleotides, nucleic acids, and polypeptides are also encompassed by the invention.

In specific embodiments, polynucleotides of the invention comprise, or alternatively consist of, a polynucleotide sequence in which the 3' 10 polynucleotides of one sequence in column 6 corresponding to the same contig sequence identifier SEQ ID NO:X (see Table 1C, column

2) are directly contiguous. Nucleic acids which hybridize to the complement of these 20 contiguous polynucleotides under stringent hybridization conditions or alternatively, under lower stringency conditions, are also encompassed by the invention. Polypeptides encoded by these polynucleotides and/or nucleic acids, other polynucleotides and/or nucleic acids encoding these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention. Additionally, fragments and variants of the above-described polynucleotides, nucleic acids, and polypeptides are also encompassed by the invention.

In specific embodiments, polynucleotides of the invention comprise, or alternatively consist of a polynucleotide sequence in which the 3' 10 polynucleotides of one of the sequences delineated in column 6 of Table 1C and the 5' 10 polynucleotides of another sequence in column 6 corresponding to the same row are directly contiguous. In preferred embodiments, the 3' 10 polynucleotides of one of the sequences delineated in column 6 of Table 1C is directly contiguous with the 5' 10 polynucleotides of the next sequential exon delineated in Table 1C, column 6. Nucleic acids which hybridize to the complement of these 20 contiguous polynucleotides under stringent hybridization conditions or alternatively, under lower stringency conditions, are also encompassed by the invention. Polypeptides encoded by these polynucleotides and/or nucleic acids, other polynucleotides and/or nucleic acids encoding these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention. Additionally, fragments and variants of the above-described polynucleotides, nucleic acids, and polypeptides are also encompassed by the invention.

### Table 3

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. Accordingly, for each contig sequence (SEQ ID NO:X) listed in the fifth column of Table 1A and/or the fourth column of Table 1B, preferably excluded are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 and the final nucleotide minus 15 of SEQ ID NO:X, b is an integer of 15 to the final nucleotide of SEQ ID NO:X, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:X, and where b is greater than or equal to a + 14. More specifically, preferably excluded are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a and b are integers as defined in columns 4 and 5, respectively, of Table 3. In specific embodiments, the polynucleotides of the invention do not consist of at least one, two, three, four, five, ten, or more of the specific polynucleotide sequences referenced by the Genbank Accession No. as disclosed in column 6 of Table 3 (including

- for example, published sequence in connection with a particular BAC clone). In further embodiments, preferably excluded from the invention are the specific polynucleotide sequence(s) contained in the clones corresponding to at least one, two, three, four, five, ten, or more of the available material having the accession numbers identified in the sixth column of this Table
- 5 (including for example, the actual sequence contained in an identified BAC clone). In no way is this listing meant to encompass all of the sequences which may be excluded by the general formula, it is just a representative example. All references available through these accessions are hereby incorporated by reference in their entirety.

10 Table 3

cDNA Clone ID	SEQ ID NO: X	Contig ID:	EST Disclaimer		Accession #'s
			Range of a	Range of b	
H2CBG48	11	745365	1 - 2783	15 - 2797	AL536879, AL536880, AW974652, BF978951, AI761251, AI655763, AA307225, AA628063, AW043567, AW376300, AI693827, BE047125, AI129587, AI701013, AA651730, AW172361, AW339506, AW085916, AA457150, AA052951, AI582629, AV688972, BF820514, AI590194, AW085909, AA916242, AI000008, AA962570, NS2070, AA293021, AI371342, BF891108, AA058439, BF946218, BF891008, AV689991, AV690900, AI458885, AI962506, H40784, AI364207, AA464514, AW994164, BF946219, AV656660, BF891112, AA336322, AA337109, AI824603, AA336509, AA336407, BF036975, AA337222, N46906, AA464515, AA319240, AA765507, AW361203, AA053434, AI928199, AW299270, AV713792, NS0282, AA056762, BE708029, AW361192, W07762, AL513817, BE965014, AI866082, AL513723, AI689470, AI684244, AI866624, BF970652, AW024594, AL514691, BF525392, AL047100, AL513687, AI963763, AI925404, AL514473, BE966388, AI634249, AI241901, AA580663, AL513553, AI584130, AV727963, BF868489, AI973288, AI499570, AI638644, AI745684, AJ765323, AI583065, AI909697, BG058398, BE964967, AL514085, BE966547, AI889818, AI890223, AI473536, AI036187, AI521799, BE892325, AL514145, AL046466, AI636811, AI540179, AW262983, AL513779, AI345415, BG110192, AV761267, AL514493, BG030785, BE879336, AI590043, AV696866, AI417790, AI698391, AW088628, AL514359, AI916419, AI433647, AI690536, AI690748, AW081383, AL514497, AL513755, BE965732, AL514455, AW129264, AI382670, AI689557, AI357940, AI277008, AA761608, AW079334, AI884318, AL514047, AI493576, AI421903, BE967005, AI590227, AW105460, AI719817, AI037582, AL037602, AV682533, BF766531, AW161202, AI469505, AI491775, AW020397, AI744243, BE540578, AI953765, AW834282, BE966577, AL514867, AI635851, AW075382, BE962903, AL514871, AL514469, AL515195, BF309444, AV747571, AI873638, AI524724, AI440239, AL514899, BE967070, AI679550, AI345612, AL514457, BF039003, AA743354, BF792961, AL513911, AA631120, AW083374, AI284060, AI623179, BF791791, AL036705, AW827289, AI363741, BE966927, AI288305, BF895218, AL514155, BE966579, AW088899, AI345416, AI267185, BE964999, AI359787, AW189415, AI538850, AI301710, AW008226, AI341690, AI611743, AW198090, AI620302, AI683606, AL513951, AW078712, AL046618, BE964726, BG164558, AI540674, AI884469, AI539771, BF724420, BF970436, AI567846, AI862024, AI627866, AI696570, AW073677, AI362522, AI679891, AI678446, AL513781, BF981785, AL079799, BF727091, AI567625, BE888257, BG104845, AL515235, AI627893, AI559619, BG036506, AW500379, AI089970, AI270039, BG031894, AI932739, AI539042, AW007309, AI367210, AI933783, AI434731, AL445590.4, BC006159.1, AL050155.1, AL390154.1, BC001655.1, AK025435.1,

BC000077.1, AB060876.1, AF218000.1, X82434.1, AK026885.1, AF232009.1, AL389935.1, AL137476.1, BC000632.1, AB048964.1, AL080154.1, AK026762.1, AL137648.1, AK027102.1, AL137533.1, AL117587.1, AL117460.1, AK025350.1, AL157482.1, AL137488.1, AL136747.1, AF155827.1, AL137268.1, AL080159.1, AL133062.1, AL354776.15, AC078878.20, BC004349.1, AK026518.1, AL050149.1, BC006414.1, AF218005.1, AL049460.1, BC003614.1, Z82022.1, AB055328.1, AF159615.1, AB056372.1, BC002473.1, BC009026.1, BC002519.1, AL110218.1, AF090900.1, BC004899.1, AK026592.1, AP001343.1, AL122100.1, AL049452.1, AP000697.1, AY034001.1, AC026431.3, BC003678.1, AK025092.1, BC006525.1, BC002697.1, AC004383.1, AL136850.1, BC003591.1, AK025099.1, AL122106.1, BC0025407.1, AB049880.1, AC007298.17, AL359601.1, AL133075.1, BC001336.1, AL133113.1, AL133619.1, AL117435.1, AL389982.1, AL121916.14, BC009398.1, S7771.1, AL137550.1, AL136805.1, AF183393.1, AK024588.1, AJ299431.1, BC007571.1, AL080148.1, AL034400.2, AP001666.1, AL389983.1, AL122104.1, BC004530.1, AK026626.1, AL121828.17, AB055368.1, AL133016.1, AK026462.1, BC008780.1, BC000751.1, AK026504.1, AL355834.4, AL137271.1, BC002355.1, AB052191.1, AF106697.1, AL137558.1, AC003032.1, AL137555.1, AC016652.5, AL080118.1, AP001346.1, AL137463.1, AK0027113.1, AL133640.1, AB060879.1, AL080234.1, AC006435.7, AL136789.1, AB047631.1, U57352.1, AL050366.1, AL162008.1, AK025113.1, AC012502.3, AL122098.1, AL110221.1, AC010149.8, AF146568.1, AK027116.1, BC005825.1, AL133010.1, BC001785.1, AL136644.1, BC006410.1, BC003684.1, AL442082.1, AL080126.1, AB062978.1, AK000257.1, AK026534.1, AK026542.1, AC026475.6, AL050277.1, AK000418.1, AP000020.2, AL357195.1, AB060897.1, AC011286.7, AB050421.1, AB052176.1, AB046642.1, AF205073.1, AJ010277.1, BC000235.1, AJ406932.1, AL389939.1, AL391244.11, AL117440.1, AK026408.1, AL080060.1, AC005902.7, AF245044.1, AK026597.1, AL512684.1, AK025798.1, AL162003.1, BC003587.1, AB055370.1, BC004925.1, BC006832.1, AFI143723.1, AB060832.1, AK000636.1, BC004362.1, AK027182.1, Z98949.1, AL389947.1, AF205861.1, BC008078.1, AL353956.1, BC001844.1, AL133049.1, AL080163.1, AK024538.1, AB062750.1, AC020956.6, AF285167.1, AL137537.1, BC008070.1, BC005858.1, BC002816.1, BC008938.1, BC002370.1, AL117649.1, BC008037.1, AB048913.1, AL136784.1, AB060917.1, AL353802.14, BC007420.1, AL512689.1, AL023657.1, AL137273.1, AL137480.1, X72889.1, AK000137.1, AC010137.3, AK026793.1, AC004200.1, AC004883.2, AL050309.4, AFI162270.1, Y10080.1, BC003651.1, AL133558.1, AK027173.1, AB056420.1, AK026746.1, M86826.1, AL157483.1, AK027144.1, AK024944.1, AF262032.1, AL136754.1, AL583915.1, AY033593.1, AL512454.6, AL133565.1, AC021325.5, S76508.1, AF000145.1, Y00093.1, AF230496.1, AC009364.8, AF055917.1, BC008708.1, BC007364.1, BC002365.1,				
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						BC000253.1, BC006195.1, AL353594.13, BC006458.1, AK02164.1, AL136780.1, BC005890.1, AL136864.1, AL359618.1, BC007021.1, AK024570.1, I.
H2MAC30	12	544957	1 - 445	15 - 459		AI089027, AA308141, AW504673, AI684832, AA225036, AI806235, AA480904, AW084470, BE246140, AI769587, AA480993, AA936449, AI743330, AW025616, R84772, AI244944, N58917, AI085514, AA504299, AI273353, AI762989, AA100979, AA857531, AW276652, AW952845, AW440624, AI277859, R74507, AW269427, AI221905, AW016095, H72021, AI150547, H65671, T89998, AI937672, H86848, R74517, R52128, BE243519, AA224988, AA588111, T89414, AA976027, Z39380, BE869329, R48449, R72429, AA229997, AA308518, BE183288, AA229612, AI694870, AV755614, AV755613, T24832, AA229703, AA620967, AA594460, AA480941, AA480883, BF059107, AA278692, AV691613, AI197824, H65670, AA480992, AA480966, AC003070. I.
H6EAB28	13	1352227	1 - 1925	15 - 1939		AL537848, BE796835, BE793657, BE793638, BF968748, BE727036, BF316464, BE728420, BF314482, BE868759, BE407252, BE409490, BE276749, BE386000, BF026545, BE871737, BE384252, BG235902, BE261749, BF125396, AI961321, AI001128, AI343334, AW135558, BE729783, AA777237, AA478021, AI623324, AI825954, BE220322, AL537847, AA232184, AA478177, BE220321, BE965762, BE276538, AA182540, AI085995, AA242851, BE621538, AI864561, AA308520, BG056114, AI872887, AA252149, D81546, H44644, R02178, BF093043, AA626640, BG149380, H43602, AA852700, AA243086, AA233362, R36915, D80941, AI687192, AA182585, AI648561, BF794171, AA852699, AA49104, BE386947, BE727929, AA776508, AA583629, AA252298, BG111945, BF448098, BE314222, AC004840.3, AF239822.1, BC002918.1, AJ289131. I.
H6EDF66	14	520498	1 - 526	15 - 540		BE799495, BE870315, BE742698, BE900654, BE791763, BG248455, BF344334, BE730337, BE391666, BF185200, BF965088, BG254451, AV705228, BE391929, BG024176, BF312281, BE733900, BF035472, AW167673, AI201515, BE042694, AI418940, BE551426, AI860382, BF185126, BF681380, AA314807, BE731195, AI433644, AA314970, AA136163, AW578378, AI961663, AA987222, AW028115, BE253524, BF980928, AA565602, BF526446, BE735334, BF378922, BE670981, BE350296, AI128534, AA136094, BE731847, BE733842, AA970472, BF476055, BF840603, AI289602, BE731086, AW578754, BG057948, BF698584, BE378726, AW089039, BF996043, BF969099, AI632291, BE394202, BE733463, N57089, BE732137, AV723730, AI004913, T47932, BE826144, BG025360, AI123961, AI368132, AW297376, AA468846, AV749647, BF001883, AI768046, BF799333, AI306532, AI810237, BF843020, AI186267, BE812248, AA953226, R22491, AI948600, BF969126, BG222282, AW605126, AA315322, BE735105, AI986335, AI564881, AA533777, BF800423, AV714346, AW969034, AA504419, AA729620, AW580802, AA307426, BE727527, AW802878, AW965714, AA355116, BF057146, BF447222, BE153061, AA489376, AW337313, D80110, AW026269, AW967151, AW090562, R29291, BG024241, AW081220, BE549901, AI467903, AI906622, AW005464, I.
H6EDX46	15	1352262	1 - 874	15 - 888		

						AA878370, AA482319, AI906618, AW793364, AW971868, AA504152, T97362, AW063774, AW843592, AA482224, BG150911, AA971165, BE699270, R15306, AI365111, AA854062, AB015631.1, BC001027.1, AF186113. 1.
HABAG37	16	637942	1 - 640	15 - 654		AW245081, AI143992, AA495832, AI361951, AI090193, AI598190, AI380542, AI990174, AI859137, AA994262, AI350501, AI394639, AI086091, AI990481, AA293019, AW003834, AA976745, AI351614, AI202144, AI115762, AA253139, BE727402, R88936, N72164, AW237082, AW025153, R90773, AI766469, AI672360, BF718243, AI745682, AW134904, AA495776, AL119175, F23330, AA417706, AW274357, AW268196, R36266, AI913519, W00431, AA496881, BE252368, AA610858, AA417588, AI685216, AW072885, BF975689, BF690095, BF984194, BG033163, AA114066, AW474388, AA133537, AI693690, BF339469, BG166654, BG164558, AW078929, AI473536, AL119399, AI345688, AL042544, AI539771, AI288050, BF812961, AI472566, AA326898, AI863082, AI633125, AI698391, AI538564, AI915291, AW152182, AA248795, BF811804, AI889189, AI866469, AI270099, AI884318, AI933992, AW151714, AW051088, AW827289, AI611743, AI933903, BF814449, AI885520, AI435268, AW078574, AI049787, AI819326, AI539780, AI584140, BE540034, AL046466, AA905473, AA279795, BF970652, AA019328, AI887772, AW087934, AI570966, AI250627, AI492528, AI249962, BF871314, AI866608, BF822127, AI224027, AI628254, AW168503, AW191844, W74529, AI352274, AI589428, AI624693, AI242248, AI873638, AI801766, AI537677, BE907440, AI702073, AI916419, AW163834, BE965169, AI249877, AI963763, AI312542, AA641818, AI357996, AI684305, BF572734, BF856052, AW500379, BE965129, AI376872, BE875407, AI433157, AI932794, AW079409, AI610115, AW983832, AI537024, AI951950, BG031894, AI582932, AI587606, AI590043, AW129230, BF814360, AI888621, AV734591, AI273901, AW085786, AI673785, BE843239, AW169790, AI651840, AL037454, AL046595, AI640729, AI811344, AI520785, BF814357, AI473451, BG177717, AA743354, AI270429, AW118518, AL513901, AI580451, AW020397, AI559296, AW026882, AA502794, AI917963, AI540821, AI538850, AI270183, AI520859, AI475139, AI362239, AI923989, BF792469, AW167021, AI678446, AI745684, BF868927, AI582912, AI640704, BF222472, AI249946, AI590021, AI679891, AL046618, BF680133, AW188434, AI828574, AI625384, T69241, AW149311, AI690385, AI590227, AI630931, AI884469, AI281757, AI476478, AA835801, AI573032, AI500061, AI680162, AI567846, AI366900, AW081322, AI951868, AI583065, AI345745, AI536638, AI815232, AI434242, AW162214, AI659795, AI702406, AL038605, AW168795, AW080090, AI472536, AI659334, AW946864, AL043355, AV745810, AI866040, AI580190, AI583533, AI561231, BF812936, BE543089, AI654750, AI923370, BF812938, AC005786.1, AF218008.1, AC005787.1, AI389935.1, AK025092.1, AL354776.15, AL035067.2, AK025312.1, U66059.1, AC026464.6, AL162002.1, AC023880.5, AK026533.1, AB048919.1, BC008485.1, BC004264.1, AK026408.1, AF225424.1, BC005678.1, S7771.1, BC004370.1, AK025435.1, AF090901.1, AK026462.1, BC004349.1, AL136850.1, AL080159.1, AK027144.1.



HACBD91	17	637482	1 - 1431	15 - 1445	<p>AL050149.1, AB047631.1, AL137547.1, BC004556.1, AL080148.1, AK000652.1, AL512750.1, AF260566.1, AF245044.1, BC003614.1, AL049382.1, BC002343.1, BC006494.1, AL122100.1, AK000250.1, Y14314.1, AL137256.1, AL050155.1, AL162083.1, AB047887.1, AL122098.1, BC001098.1, AL133619.1, AL050138.1, BC002733.1, AK026532.1, AB060912.1, AL049339.1, AK000418.1, AL080154.1, Z82022.1, BC007556.1, AK025484.1, BC009341.1, D83032.1, AL133645.1, BC002342.1, AF205861.1, AL353956.1, AL137488.1, AL161899.21, AL136622.1, U77594.1, AL110196.1.</p> <p>AI123694, AA203656, AV707802, BF575227, N77966, AW956121, N71852, BF732312, AI338999, AA704675, AI742966, AI176725, AV744696, A039168, AA329423, AA680411, F10345, T85994, AV682639, AA731436, AV735262, AV733694, AA505796, AW959998, BF793146, H79631, R00088, BF978632, BG034327, AV716953, AW955313, BG032189, AV717860, AV716893, BF244606, AV733654, BG030662, A1802907, AA528524, AA973692, AA658895, AV714250, AV718258, AV716004, BF029739, F26324, AW772717, BE909294, AA370595, AI392630, BF529817, AI914394, BE748127, AA975366, BF029799, AI126532, AA977864, R38577, A1093884, AW264528, AI351443, AA916014, AA359165, AA594324, A1682171, AA404535, BG034254, T75123, AI832970, AA973611, AI833308, AI814033, BE781781, BF035996, BF036344, AA888167, BE541776, BF109665, BE551387, AI268514, AV710503, AI709250, F33691, BF216659, F33502, BE467615, AV738506, BE503802, AV763934, BG110890, AV742881, AV710956, BF965198, BG033031, T90966, R02459, F32392, BF029956, BF690853, AV764373, BE738142, BF244383, AW772766, BF978393, BF030821, BE548289, N64163, BF576733, AW872492, BE218579, BE539011, BE042987, BF978138, BE217894, BF692527, AW419258, BF219313, BF244019, R02355, BF242775, AA340839, AW440167, F30529, BE748667, AA640120, BG179795, BF679132, BF382290, AI719390, R35603, BF240791, BF691038, AW009337, AA886535, BE738709, AI253328, AW268515, BF977850, H79632, AV764541, BF214426, BE184678, BE171856, BF382191, F12739, BF031722, BE564110, F21702, BF219100, F26311, F27624, F31646, F24066, F30253, F21442, BF030470, BF215493, AA365400, AV725369, BF243623, BF216495, F23622, R38445, Z20180, F23439, BF031636, AA340808, BF246303, F29361, BF212059, D19917, BF210763, AI720401, N58379, AA706899, BE737668, F37786, AC009289.8, BC000855.1, AF044957.1, AC008804.6.</p> <p>AL538454, BF530920, BF530060, AI970528, AI860328, BF527064, AI798917, AL538453, BG054790, AI923543, BF219866, BF528175, AV752086, BF526803, AI800076, BF526264, AW206433, AI337330, AW245447, AW237083, BE858481, BE466614, BF437709, AI497639, AI160768, AW245805, AA131235, BE672804, AI160855, BF109500, AI675102, AI804002, BG060000, BF222422, AI982947, AI355974, AW590096, AI418181, AI312842, BF224013, AI088289, BG056127, AI332684, AI341205, AI654907, AI083806, AI798674, AI470925, AI190394, AW139187, AI092606, BF222526, AI291977, AI611140, AW135968, AW204680, BF106163, AW025331, AI167288, AI656880, BG058349, AA971379, AI399811, R72939, AA037774,</p>
HACCI17	18	891114	1 - 1708	15 - 1722	

					AI150867, AI928634, AW302173, AI918209, AI350940, R73561, AA034204, BG152416, AI810527, AA621414, BF061361, AI783733, AI817644, H94482, R60154, T35689, BE504130, BF111371, BF725784, AI970869, BF056386, BF445420, AI925534, BF831443, AA885412, H49844, AW572977, BF939724, BF220095, R60153, F37217, BF525690, AI654502, AW189678, AA131356, BC002404.1, AF000959.1, AC00082.4, AC00071.2, AC00088.2, T69988, N39621, N46769, AA034265, AA918849, AA707092, AA758314, Z38200, AA772946, AI418724, AI420314, AI423722, AI423730.
HADAO89	19	570689	1 - 1439	15 - 1453	AA937957, AA280310, AA169289, AW474052, AV760571, AW021583, AI801482, AI281881, AA521399, AA521323, AL044940, AW970896, AV760777, AL037683, AV757607, AA587256, AW956640, BE139146, AI805363, AL042420, AL434706, AA468022, AW956641, AA502155, AV759505, AV763122, AA828704, AW276827, BF827410, AV762067, AW673241, AI564496, AA613232, AA984708, AV762571, AV761745, F03525, AV760190, AV758600, AA774780, AA507824, AA483223, AI143242, AV762535, AF330238, AC006365.3, AC021188.6, AC006509.15, AC004072.1, AL121877.13, AL133321.11, AP001748.1, AC008848.7, AC009516.19, X54181.1, U04355.1, AL109984.14, AC005197.1, AC027612.6, AL157713.10, AC002985.1, AL357497.17, AC005082.3, AL391478.14, AP002534.1, AL135839.15, AL121934.17, AC002558.1, AP000513.1, AL354735.14, AC006511.5, X54177.1, AC005081.3, Z75746.1, AC007666.12, AC006064.9, AC006019.2, AL162505.20, AL356095.11, AF205588.1, AL161670.4, AL136179.15, AC016138.8, AC004895.2, AF196779.1, AP000512.1, AC008447.7, AF117829.1, AC006464.3, X54175.1, X54178.1, AL513366.11, AC004089.25, AL096712.20, AC008770.6, AL008629.9, AC090043.1, AL354932.26, AC004834.2, AC011464.5, AC007956.5, AC069255.18, AP001732.1, AC005015.2, U67828.1, AC010326.6, AP001725.1, AP000553.1, AL049849.1, AL022147.3, AC011520.3, AF049895.1, AC025280.4, U95740.1, AP001630.1, AC034193.4, AL445483.13, AC073136.6, AL138787.11, AC000052.16, AC007999.12, AL353739.4, AF192304.4, AC004941.2, AC018808.4, AC068533.7, X55923.1, AC012442.7, AC018695.6, AP000567.2, AL357560.11, AC010470.6, AC004971.3, AC003101.1, AL132716.6, AC016026.13, Z97989.1, AL109823.23, AL022322.1, AC010651.7, AC004019.20, AC007537.3, AC020584.9, AL355922.4, AP002007.4, AC011497.6, AC004158.1, AC018682.4, AP000963.2, AL021393.1, AL078472.3, Z83840.7, AC007021.3, AC006433.18, AL356863.11, AC073866.16, AC008569.6, AC009244.24, AL450342.14, AC007016.5, AC015982.9, AL121787.22, U67829.1, AL118506.27, AL359853.18, Z83826.12, AC090042.1, AL161747.5, AC008383.8, AC025168.7, AL137077.31, AC003085.1, AL136123.19, AC012320.6, AL356915.19, AP000696.1, AL354828.12, AI295844.1, AL445217.3, AC010328.4, AC015801.25, AL391827.18, AL109855.16, AL139421.11, AC009131.6, AC004913.2, AC010422.7, AC009506.5, AC022415.5, AC002470.17, AL121869.19, AC006330.5, AL133215.16, AL031431.8, AC010513.6,

					AL133588.25, U91326.1, AC073542.4, AC007220.4, AC007132.3, AP001726.1, AL133286.9, AL357558.6, AC022078.12, AP000047.1, AC011247.10, AC018751.30, AL034549.19, AP001724.1, AC008687.4, AP001415.1, AL163201.2, AC072061.8, AC008040.7, AC006515.7, X55931.1, AC005971.5, AL031904.1, AP001680.1, AP000017.2, AC004067.1, AC007845.12, AP001631.1, AC005006.2, AL137791.19, AC004166.12, AC004004.1, AL021453.1, AP001666.1, AF015720.2, AC011510.7, AC011479.6, AC007057.3, AC018828.3, AC040160.4, AF020803.2, AC035147.3, AL030997.1, AL161799.19, AC006947.2, AC000159.6, AL449106.15, AC021752.5, AC004965.2, AC012492.9, AB004907.1, AF312032.1, AF131215.1.
HADCP14	20	757866	1 - 1018	15 - 1032	
HAGAI85	21	381942	1 - 1738	15 - 1752	AL526844, AL534504, AL532583, AL526885, AL534503, AL532762, BF791804, BF979873, AU139874, AV706645, AW952336, BF979324, AU139805, BE615117, AW189934, AU129651, AW572808, AU158184, AI613227, AW969259, AA854118, AI057339, AW029537, AI810068, AV725299, AI460229, AU151734, AI676226, AA450163, BF217638, AI242616, R76281, AI004063, AA450100, AI095551, H46944, W05356, AI075684, W31703, T86800, AI339293, R85337, AA468695, H94753, H46945, AA323897, R77461, R77559, R26135, H43527, R80736, AA772424, H60113, R63353, H12406, H12407, R85338, R76558, R26349, R63354, AI609126, R68089, R68131, R80737, AW103602, AA745911, H59459, AI122795, Z41708, AI248729, AI800670, AW798408, BF931590, BF896996, BF735086, BE929484, BF903415, AV724914, U83461.1.
HAGAM64	22	626997	1 - 2307	15 - 2321	BF925125, BF925123, BF925124, BF925118, BF925117, BF925120, BF925126, AA564576, BE159227, AC009466.17, AP002853.3, AP000880.4.
HAGAN21	23	1026956	1 - 829	15 - 843	Z69655.1, AL391987.15, AC004841.2, AL121796, AL121796, AC074370, AC074370, AC011967, AC011967, AL355151, AL355151.
HAGBZ81	24	456414	1 - 1368	15 - 1382	AL532808, BF356940, T26989, F07451, T26988, BE089554, AV753931, AA176259, Z38391, AI652752, AU123074, AU132666, AV753734, BE876059, BF911695, AV755178, D61463, AI267311, AW387165, AW178928, AW374679, AW374832, BE089568, AW374731, BF700420, BF914304, BE173287, AW178920, AW751520, N83868, AW387129, BG170148, AW374762, AL120973, BE933886, AI915992, BE004012, AF224469.1, AF306765.1, AF184241.1, U03109.1, AF289489.1, S83325.1, AF224468.1.
HAGDG59	25	534165	1 - 1720	15 - 1734	AV694248, BE895909, BE903848, BG027942, AV651246, BG109867, BF240140, BF217526, BF669125, BE779936, AV650099, BF971092, AW875350, AW956342, BF107182, BF697022, BG166672, BF030619, BE881774, BE548671, BF247518, AI888053, BF667451, BE872808, AI768748, BF792803, N37046, N23484, BE872350, BF239058, AW664126, BF107464, W88681, AW338066, AW952476, AW402833, BE971415, AW853145, BF968304, AI636324, N24759, BF665132, BF213364, AA830565, AV697089, AA167203, AW023148, AI815125, AI685119, H98763, BE465545, AW853521, AW405572, AA481430, AW604402, AA481434, AA223067, AA902413, AW578436, BG258700, AI954984, AA045833, AI567716, BE856103, AA577610.

					<p>H42133, AA553538, AA470843, AW467047, AW169016, AI961753, H38614, AA835545, AI262411, AW192401, AI193508, AA576473, AV660930, AW262909, AA263040, BE927225, AA481670, BE782154, W88620, AA394254, BG261374, AA730743, AA653560, R80477, AV651327, BF572366, AW193089, BF904780, AW470979, BF904779, AW295546, AA045967, AA329460, H42134, AA213836, R23904, BE243520, BE693582, AI263974, AW293723, AA481674, H61494, BF674778, R23903, R80672, BF032805, R61171, N79745, BF382094, H38856, AA328661, BF902314, BF243422, R27506, BF894060, T72506, AW361405, H62468, W07107, AI468319, AA362581, R27793, AW853797, AW337877, AW075817, BF031795, BE866675, BF905580, T82403, R27885, AW339053, AA377009, BF791479, AI708354, AA485696, BF239244, AW051074, BE866177, AI497897, AA485827, AW273624, BF905573, BF205089, AW022407, AI678575, Z21560, BF238897, BF699925, BE926278, BF239919, AW836245, AF126780.1, BC008650.1, Z64479. 1.</p>
HAGDS20	26	544966	1 - 905	15 - 919	<p>AA868268, AV753204, BF508347, AW955047, AI189167, AI954727, AA846227, AA890483, W26549, W28161, AI968337, AI825637, AI867864, AA994720, W28495, AI583722, AA322758, F03086, H05784, BE046942, F04216, F04217, F09502, H09569, AW003785, R27561, F03481, T65017, AI333440, AI375236, Z21293, AA255454, AI640211, T66099, AC004816.1, AB048907. 1.</p>
HAGFG51	27	823509	1 - 1299	15 - 1313	
HAHDB16	28	635412	1 - 782	15 - 796	<p>AI688902, AI983921, AA843874, AA745961, AU150602, BG169215, AW571697, AA581433, AI685116, AW190486, AA152091, AI927861, BG059728, AI811494, AW089655, AI924175, AU118990, AI872415, AI858607, AI610776, BE044603, H97952, AF063514, AL137994, AV719347, AA189081, AW177120, AL133942, AW090739, AA767353, AW167319, AU145663, AA724159, AA493998, AA773359, AI367384, W49501, AI925647, AI334099, AA631430, AU143906, AI874256, AI264673, AI887321, AA160519, AL119355, BE646447, AW468887, AI749571, AW177226, AI761656, BF882284, AI801377, AW177317, AV726924, AU121759, AL036881, AI082077, AW177231, AI088796, AI675848, T16214, AI818151, AI627862, AW994225, AW084901, AW177264, AI250812, AU157470, AV730063, N64574, AI625127, BF056069, AW073349, AI735074, AI590151, N24958, AW813744, AI963795, N76274, AI732743, AI560839, AA174085, C06012, AA085707, AI811854, AA601264, W03759, AW090210, T69719, AW177237, AV699636, AI570877, BF823687, AI418614, BE379085, AA152017, BF436023, AA953572, AI433018, H91008, BF930080, AA709024, N79242, AU145674, H64113, AV720543, AI346802, AI568919, AU146451, AA287329, AW242205, H90881, AW242735, AA778304, AI034217, AU145383, AW589529, AI628043, AI027421, AW235478, AI860964, AI499811, AU146974, BE148908, AI375534, AA946637, AA807609, AW157413, AI683685, BF760502, AW589501, W87732, AA524883, W58442, AA678653, AI591192, AI189033, BF439824, AA470572, AI136637, M62281, AI632138, R48563, BE247178, AI272961, AI376984, AI524521, AI197934, AI025602, AW874038, AU143935, BG235936, AU144339, AI955464, AA782144,</p>

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HAHDR32	29	635357	1 - 1242	15 - 1256	AW961789, AL278626, BE856740, AI741753, AW028042, AI140668, AI095493, AA044732, AA577689, AW029335, AA044769, N93590, AA053971, AI204064, W03843, C03899, AI027848, BF892912, BF675682, AI074523, AA523465, AA347782, AI190976, AW170748, AI066686, AA345846, T86306, AA347781, T86404, AV710766, AA034459, R15471, N86784, AA448615, AA091937, AI086872, AA090967, N89145, Z21820, AA095754, C03190, C03750, AA094439, N55992, N56032, R58248, R45879, N75018, AA090605, AA216219, AA247579, AW800864, AA321320, AA249880, F30220, AA249861, AF204173. 1.
HAIBO71	30	490848	1 - 738	15 - 752	AI767324, AW976385, AI121194, AA972628, AI095851, AA743343, BE566411, AF118928, AW366882, D20570, AC009802. 13.
HAIBP89	31	727543	1 - 2229	15 - 2243	AL519706, AL526798, AL525802, AL525691, AL522375, AL525839, BE792809, BE743896, BE796567, BE743399, BE260643, BE543107, BG030916, AV714392, BE889610, BE277440, BF527074, BG110983, BG181079, BF027018, BE264922, BE386448, BE382754, BE407284, BG113064, BG032444, AW991399, BE884015, BE772873, AI309611, AA442698, AW249227, BF310578, BE312050, AI421417, BF685976, BE259606, BE618656, AL522376, AW248427, BF970944, AI300569, BE564324, BE207989, BE387042, BE261799, AL531714, AI884919, AW005650, BE061923, AW960504, AW601219, BF342013, BF848073, AL525736, AA564704, AI089642, AL040087, W60773, BE207992, AA903950, AI309614, AI085644, BF347393, AL526831, AA258978, AA009753, AI419210, AA216411, AI865848, AI683537, AW117839, AI206510, AL519707, AI620366, H58361, BF752057, AW373946, BF752053, AI520851, AL525315, H42973, W42711, AW601221, AW016488, H08339, F22598, AA494395, AI005664, AI372774, H58750, AI565541, AA778118, AI828095, BE796020, AI225112, AA576831, BF347545, AA971475, AI339860, W42904, AI096947, W60487, AI243479, AI961803, AW780312, AA449981, BF760874, AA706303, AA975280, BF796645, AI126822, BE796322, W57667, AI096594, AA917878, T16862, H94211, H24045, BE718404, BE813302, H42902, R08029, F11443, F09106, R08078, BE718388, BE718374, Z43495, BF846294, BE718393, BE718373, BE831316, BE831321, AI446598, BE718398, BE718392, Z39564, BE831301, AA608866, AI245647, BE718387, BE718386, H08338, AI564884, BE718381, AA301909, BE718412, BE718462, BE718376, BE718450, T69855, BE718396, H80027, BE718385, BE718378, AA135410, BE718469, BE718384, BE718433, BE718463, BE718416, BE718439, BE718440, BE831330, AI091920, BE718406,

HAICP19	32	422672	1 - 1610	15 - 1624	BE718461, BE718474, BE718473, BE718391, AW247973, BE718428, BE718421, AA889882, BE718468, H24152, A1472790, BE718464, BE718414, BE796664, BE170203, AL567456, BE718434, T34673, BE535472, AW768533, BF684007, BF983562, AW603147, BF764766, BE718372, BE706857, BE718427, A1698197, BE301688, H80028, BF755901, BE545526, BF311070, BE831325, N99825, BE408007, A748817, AA330823, T16863, AA496030, BF528120, BE618415, BF835449, BE867723, BE718371, AA577513, A1275679, BG258831, BE140382, BE718453, A1758601, AW073256, AA247329, BE718452, BF035652, BF350213, A1885794, BE718443, BE718370, BE264666, AA135816, BE718448, BE903062, BE718441, AA403264, BF033582, BE299203, BE718436, AA258159, BE718451, BE297450, BE718471, BE298268, AW410472, BE718438, AA094849, BE410972, BE718467, BF354955, BE718409, U83557, BE905907, AC005214.1, N70685, AC005214, AC005214.
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HAJBR69	35	638516	1 - 741	15 - 755	BE262907, AW503376, AW503644, BF982382, BE079288, AW504239, AA701415, BF315343, BE277664, BF921555, BF736464, BF756620, BE720223, BE815902, AA490675, BE930704, AW971745, AW804686, AW392670, BE695785, AW861944, AW604723, AW877209, AL119483,

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HJJBZ75	36	618530	1 - 2075	15 - 2089	AL529012, BE440014, BE546526, BE908087, AL037642, BE784646, BE617041, BE619152, BE791490, BE257606, BE962354, AW069180, BE740246, BE743316, AV701495, BF793697, BE410370, BF589487, BF034893, BF438638, AA442426, AA307880, BE621319, BE617390, BE299387, W46237, AW149792, BF197170, AA459238, BG255347, AW967185, T70170, BF679079, AI038975, AW008086, AI363208, BE207335, AA622048, AI347908, AI089610, BF038813, AI090281, AA463308, AW239176, BF689996, BF155465, AW169069, AI360030, BF155458, N20554, AA418177, BF844135, AI206446, AA677846, AI078405, AI281033, AI619944, W46238, AA716397, BF155444, AI363209, BF844120, BE816417, H57560, AA781638, AL529011, AA417926, AA725052, AA232141, AI245901, AW967343, BE814103, H70103, AW576723, AA587473, H57559, AI674249, AI184096, AA360949, Z45980, AA316453, AA300586, AW753961, N29266, BF879123, BE843416, AA380017, AI3711374, AA404562, Z41593, AW197868, R19820, AA911964, AL526898, AA347813, Z43143, AA243103, AA633085, AA256621, AL526862, H16339, AA382930, BE065656, BE720795, AA907215, AA301927, T23530, BF037167, AA545811, AW578884, H69686, BF088878, R05400, BE766771, R08535, AA300594, AI887107, AI382910, AA25276, AA226403, AI868215, AW883612, AW800073, BE931847, BF690072, BG106304, AA709274, BE715584, AW380609, BE172905, BE619715, AW859456, BE715507, AW591554, BE939029, BE939020, BF736794, AL044317, AI820826, AA808498, AA490686, AI820767, BF677125, AW795338, AW795199, AW576726, R29190, BE763875, AI869467, BE832738, BE313356, BE832684, AA234630, BF764590, AI921710, BF155825, BF155822, AW879422, BF815725, AW934761, AA872519, BF793670, BE645187, AL050022. 1.
HAMFC93	37	904749	1 - 2520	15 - 2534	AL527550, AU125104, AL527551, BE778398, BE896270, AV707124, BF096200, AV708552, AV705306, W96031, H29070, AI572861, AU148837, AI245433, AW338844, AI763055, AI650351, AW952271, AI360130, R46410, W90464, AI401499, W67631, W96045, T75273, W94664, AI423467, AI056363, AI089950, H19055, BF197222, AI924428, AA515661, R19672, C06006, W94808, AV706302, AW271475, BE245395, H19345, AI753937, AI277502, AI687583, BF109162, AW467763, BF036171, AA324890, R16165, H16164, Z44059, R44459, AI366519, R15424, F06854, Z43164, F06351, AW662960, R15425, T80223, W19999, AI290371, AI280283, T05756, F03118, F12961, R66672, AA293579, R65758, R18499, AA331471, F08386, AI696837, F04611, F05628,



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HAMFK58	38	647105	1 - 771	15 - 785	

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HAPNY86	39	587261	1 - 1266	15 - 1280		AL354977.10.
HAPPW30	40	1352278	1 - 1458	15 - 1472		BF568560, BF309463, BF568858, BF968457, BE729680, BG121453, BE044480, AW958703, AW957664, AW341517, AA868588, AA479992, AA758865, AA305964, AI276502, AV696016, AA846842, BF963424, AW510684, AI183515, N41325, BF674083, AW273135, AA954695, AI685296, H57026, AA969117, AI147710, N95033, AA962530, AV650263, AA758255, BF929642, BF798962, AI337591, AA150989, AI675402, AA775255, AI167695, AI798973, AW172620, AI359078, AI688288, AI151098, BE931071, AI911606, AW469667, AA383301, H83172, AW749394, AW603134, AI188832, AI078598, H58146, AA446238, AA310796, AA724109, AA864698, AI240610, BF033606, BF854704, AA953573, AA421572, H41807, W15373, H48433, H46522, AI739312, AW956749, BF951265, AA977855, AA757910, H87382, AI216014, AA877407, AA098821, BE168746, BE208218, W38885, H46521, R11443, R19191, H82944, C04986, AI479980, H56935, W72627, AI216655, AA975974, R99133, AA922234, AA339733, AA375160, BF352033, AW183259, AA421590, AI459843, BE930311, BE930299, T61945, AI216656, AI902298, H70309, AI902295, AI191499, T71506, AW844824, AA383302, N57057, BF800855, AA150942, AA568552, T62175, R94393.
HAPQT22	41	587601	1 - 621	15 - 635		AI002744, BF680944, AW732188, AI167511, BF868994, AI979005, AL157938.22, AP001711.1, AC013356.8, AC022217.5, AC005225.2, AC090942.1, AC011811.42, AC005052.2, AC020915.6, AC066589.3, AC027319.5, AC005098.2, AF109907.1, AC008569.6, AL135927.14, AC007227.3, AC020931.5, L44140.1, AC020558.4, AP001725.1, AC011487.5, AL034405.16, AC011465.4, AC004382.1, AC009244.24, AC004801.1, AC004526.1, AC009086.5, AL050341.18, AL139316.5, AL445222.9, AL049760.26, AC007240.2, AP001748.1, AC087071.2, AP000501.1, AC007899.3, AC012309.7, AL390374.16, AC005399.19, AC008812.7, AF243527.1, AC003665.1, AC004166.12, AC011445.6, AP000503.1, AC006241.1, AL031575.1, AC004686.1, AC020916.7, Z97054.1, AL450226.1, AC002544.1, AC011497.6, AL357952.7, AL031767.13, AP000088.1, AC004953.1, AC004965.2, AC009412.6, AC004867.5, AF134726.1, AC005840.2, AC020913.6, AC018690.5, AC011477.5, AC009477.4, AC006441.13, AC018644.6, AC011500.7, AC016742.10, AL122035.6, AC007546.5, AL590763.1, AP001889.4,

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HASCG84	43	603947	1 - 1065	15 - 1079	U69188, AW967218, AA524082, AW964322, AA477567, AW135981, BF436586, H14669, AW965610, BE870961, T62872, BF336026, A1309281, A1653643, AA629824, BF507821, A1268700, BF799497, AW607114, BF437588, AA307058, AA662791, AW204504, AA985578, A1831853, T09193, H05165, R44815, T62722, Z39918, AA477443, AA514678, BF962688, BE784445, BF184514, R41285, AW953430, T08773, T33866, BE539074, D61598, AW571983, BE702716, BE702704, AA345841, AL039974, BG058150, BG250744, AV728806, AA830749, AA761343, AB033058.1, AL139109.14, M85165.1, AL049426.1, BC004934.1, AL096720.1, BC000235.1, BC002816.1, BC000761.1, AK026950.1, AB056798.1, BC003637.1, AL136635.1, BC003122.1, AF098484. 1.
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HATBR65	45	635514	1 - 798	15 - 812	AW754098, AV747079, AW964560, BF827304, A1697254, AA826321, AA663880, BF924786, AA772037, AV725414, AA826164, AA663006, AA826322, BE062047, AA835931, AA319870, R95053, AV760830, BF918713, BF959165, A1053538, BF930635, BE828744, AA078591, AF139781, AA491430, AA078183, AW393403, W74390, AW578861, AW393400, AA320812, BF840307, AA078213, AW752269, BF757569, AA077448, BG004304, AW793003, AA047825, AA001509, AA076683, AW857010, BE183669, BE183617, BE699552, AV720211, AW973541, BE932909, A1254770, A1284543, A1251203, A1249853, AV743864, A1251284, AW276678, AW966385, BF952670, BE707812, A1251034, A1250552, AW970571, AW869794, BE139139, AA609826, AW303098, AA552586, BF952311, AV719632, AV718487, AW905386, BE138387, AV720104, BF952747, AA015737, AW975623, BF129140, AA076784, AA604865, BG222875,

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HATCB92	46	603948	1 - 1742	15 - 1756	AL253043, AA621792, N84222, AA094505, AL522648, AC009244.24, AK025372.1, BC008349.1, AB020635.1.
HATCP77	47	748244	1 - 2084	15 - 2098	AI791525, AI733035, BF434939, BF433029, AI457816, BF478158, AI299145, AA910198, AA952936, AI301175, BF446488, AA904191, BF477842, AF209747.1, AF099137.1.
HATDF29	48	845965	1 - 1341	15 - 1355	HI1153, AA353878, AF074924.1, AF076605.1, AB036429.1.
HATDM46	49	974065	1 - 2311	15 - 2325	AI085242, BG029528, BE062478, AW962444, BF925617, BF868994, BE062476, AI369580, AA515728, AL515875, AA484366, AW819125, AV756491, BF725761, AW303196, AA587604, AA503019, AW301350, AI560085, AI963720, AI800180, AI440117, AI732120, AC011472.7, AL365505.15, AC004382.1, AF001549.1, AL333752.6, AL391647.16, AC004605.1, AC007371.16, AP002007.4, AC002404.1, AL162426.20, AL109825.23, AL121895.26, AC004125.1, AC012476.8, AL354829.8, AC010150.3, AC004796.2, AC003950.1, AL034548.25, AC083884.6, AC004883.2, AC015982.9, AC011479.6, AL121653.2, AL391280.15, AL121601.13, L78810.1, AL356805.5, AC004400.2, AL049776.3, AC004967.3, AC072052.6, AC011475.6, AC010543.8, AC007688.15, AL137162.25, AC024561.4, AL132712.4, AC002477.1, AP000140.1, AC005015.2, AL499628.1, AC005077.5, AC004859.2, AC003692.1, AL158830.17, AL353748.13, AC005091.1, AL133163.2, AL121897.32, AC008649.6, AL020997.1, AL022721.1, AC034193.4, AC005225.2, AL138836.15, AC007263.4, AC016543.6, AC006345.4, AC018808.4, AC018500.3, AC006071.1, AP000088.1, AC006011.2, AL162578.13, AL021918.1, AC007383.4, AC007773.1, AC005522.2, AL161629.10, AC004929.2, AC007225.2, AC024952.4, AC005280.3, AL050349.27, AC007256.5, AC022007.3, AL157823.9, AC005900.1, AC018809.4, AC004707.1, AF003626.1, AC003037.1, AC018636.4, AL121988.10, AL355392.7, AC009955.4, AC020550.4, AC005180.2, AL139089.13, AC007956.5, Z95113.2, AL354720.14, AL117258.4, AL355520.8, Z83844.5, AL136527.9, AL031390.4, AC002984.1, AP001731.1, AF196971.1, AC016898.6, AC006435.7, AC005520.2, AC004821.3, AF168787.1, AL035455.30, AC020904.6, Z99716.4, AC007685.2, AL589723.7, AP001694.1, AF050154.1, AL133245.2, AL049540.11, AC004826.3, AC003010.1, AL034405.16, AC004084.1, AC004232.1, AC006312.8, AC009155.3, AL139081.21, AC006254.10, AL358777.12, AL354943.9, AC008622.5, AL080243.21, AC004878.2, AL034422.24, AL359091.10, AC004685.1, AC005288.1, AC006530.4, AC018821.4, AL021977.10, AC011890.4, AL139022.4, AC007366.4, AL034380.26, AL121845.20, AL353579.17, AL353597.20, AC002416.1, AC006211.1, AC009060.7, AF196779.1, U91318.1, AC023510.16, AC011464.5, AP000208.1, AP000130.1, AC008892.5, AP000558.1, AL121890.34, AC008481.7, AL133377.10, AL136139.6, AC004813.2, AC004089.25, AL031311.1, AL121585.22, AL158196.24.

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HATEE46	50	565618	1 - 1661	15 - 1675	BE739761, BE867642, BG252738, BF670373, AI590088, AA452296, AW188012, AI467834, BF110214, AI698059, BE355889, BE220673, AI076779, BG170578, AW304047, AI653610, AW070709, AA015580, BE300577, AA705209, AI458930, AW173124, BG149183, AI037932, BF671524, AI597851, BE671575, AI310753, AI051897, AI128681, BF447913, AW295982, BF433016, AI300950, AI140885, AW473730, BF448227, N35880, AW770729, BF108371, R72042, AW302140, AA479329, AW023183, AA040787, AI494017, H98707, AI453020, AI932397, AA041222, AI038152, AA478593, AI459059, AA151356, AI168123, AI160559, AI125997, AI702632, AI073784, H97885, AV746537, AI433746, AI348429, AI025926, AW178814, AA035147, AI917957, N26242, AI189919, AI298395, AA225891, AI383747, AW085003, BF431762, AW079138, AI214632, H57061, N27692, W20186, AI537044, AI796916, AA661665, AI290329, AI383748, T39342, H99889, AA045544, BF433765, AI948963, AI143362, BE044374, AA767678, N36000, AI203768, H88073, AA311260, N91032, AW794932, N27062, AI382971, R19439, AI037915, AA829174, N24274, N50690, AI702532, AI192385, AW166934, AI979183, AA664910, AA056938, R20449, N92329, AI625107, N43958, AW193300, AA095102, AW88582, AI160547, AA515467, N36021, N28575, N50773, BE536609, AA054589, BF694768, N73785, BE814490, AW606976, BF942077, N99407, AA151355, BF942458, AW663523, BE046513, AA897347, AI829594, BF130347, BE814323, BF089510, BE738984, AL133574.1, AL117450.1, AK027342.1.
HBAFJ33	51	625916	1 - 1266	15 - 1280	AL134941, AI936102, AA806752, AI922844, BE396072, AI568741, AW593236, AW152304, AI417415, AW629175, AI017620, AW055249, AW166099, BE858335, AA115732, AI127303, AA576745, AI829922, AI478929, AI355013, AW593259, AI814920, BE301136, BE858329, AI424011, AA975643, AI032624, AI457317, BE858317, AA733170, AI334944, AI151526, AA478034, BF195105, AI291127, AI690771, AI220431, AL043583, AA593974, BE795539, AI096520, BG251676, AI094885, AI831777, AI143003, AA204724, AW080063, AA687374,

					AA179553, AI373929, AA961480, AA677252, AI539748, AI150654, AI811537, AI565632, AI138450, AA931056, AA974477, AA89899, AW070496, AA886867, AI360841, N51090, AA427863, AI499657, H99368, AI347782, BE613141, AI362268, AI369607, AA179986, BE619719, AA039351, BE350785, AI200968, AA134403, AW739644, AI376627, AA642471, AA133209, AA035355, AA224345, AA854796, AI123495, H93126, AW821145, AA872914, AI707705, AW935023, AA804238, AI312418, D80144, AA723522, BE766774, BE834005, AI445884, BE766739, AI520801, BE177107, AA032258, N98499, T33101, BE742708, CI4225, D51441, BF664500, H59455, BE082634, R96670, AW009711, BF093621, AW935098, H52680, AI265911, AI129147, BE177074, T74907, AA782664, AA568793, BE743686, D31233, BF670650, AW022342, BF336698, BE082719, R97433, AA152475, AA427988, AA365942, BF975267, AA099862, AI372406, AA922699, T33142, T32913, F34614, AI676138, N34899, BF879062, AA852622, D80145, AW794944, AI352444, AA363998, T30009, AI372746, BF873002, H08716, W31065, BF872967, W28879, AW881570, BE547161, AA312863, AI039527, AW082087, BE771401, R70284, BE262112, BF340241, AA319768, AI420273, AA868050, AW513743, AI583354, BF349629, C14224, AW881571, Z38385, AA443158, AA354867, AW881573, AU149417, AI911845, R91976, H56262, BF975357, AA661955, F04560, AW364002, R41447, AV727127, AI911845, R91976, H56262, BF975357, AA661955, F04560, AW364002, R41447, BC255586, T75007, AI857675, AI076059, AA627769, BE717493, AW754481, BF690414, AW799938, AI797975, AA478191, AA548786, W22044, BE939215, BE081547, BF378280, BF365011, T24992, AW381095, AW839942, AW363800, AI124578, BG166902, BF770472, C01685, BC000778.1, AK025162.1, BC008847.1, AF214731.1, AL136886.1, Z48570. 1.
HBAFV19	52	843036	1 - 939	15 - 953	AL516557, AW273167, AW301700, BF795352, AA704856, AI808501, AI633808, AI050770, AI500656, AW902226, AW964585, AA480361, AW445068, BF354764, AA886018, AA886008, BE535750, BF307524, AI480277, BF960307, AA321228, AI565943, AI493176, BF960304, BF336986, AW027985, BF308034, BE159877, AI653941, BE829951, AW664513, AI135012, AW858522, AW577199, BF084778, AW601637, AI134110, AL045494, AI134524, AL042523, AL045327, AW577201, AL042420, AL042468, AW577192, AL045328, AL047163, U46344, AL042741, AL042655, AL042898, AL136927.1, AK025498.1, BC009255.1, AF001781.4, AC000381.1, AL136764.1, AL136762.1, AL133053.1, AL136763.1, AL136755. 1.
HBAMB34	53	553553	1 - 1013	15 - 1027	BE673228, AA771964, N93148, AA844453, AA782604, AA936090, AA594712, Z23123, AW015698, AI589136, F00234, AA479120, AI301192, BE348256, AI769699, AI870557, AA676477, AW074427, AI216517, AI378183, AA505080, N34510, BE644673, AA854947, AI355342, AI915783, N51070, N39571, AI568614, N57476, BG107565, BE670027, N47320, BF437948, AW071941, N66687, AL353708.10, AL353708.19, AC022407.6, AL354809.12, AC007350.1, AC005921.3, AL445928.8, AC005068.2, AC002542.1, Z75747.1, AC006252. 4.
HBCPB32	54	1352403	1 - 1354	15 - 1368	AL522529, AA776274, BE439690, BE439637, AI421729, AI421796, AI031855, AI418669,



HBHAD12	55	420036	1 - 772	15 - 786	AL522530, BF312464, AL530028, AC024191. AW905621, BE087451.
HBHMA23	56	848016	1 - 1161	15 - 1175	BF672220, AW384404, AI924632, AW167650, BF743981, AW449208, AW363590, BE693858, BF827339, BF826403, AI909935, AW167610, BE073612, BE061388, BF089104, BF088537, BE829540, AW577643, BF356926, BF827064, BF355973, BE926857, BE720600, BE934196, BF804024, BF831089, BE933114, BF742671, BF355970, AI024451, AW381927, D45555, BE934074, BE932793, BF827455, BG150765, BF356272, BF356040, BE933205, BF830960, BE720102, BE933204, BF831058, AA428580, BF095122, BF827065, BF743071, BF874568, AA316552, BF827647, BF088448, BF356778, BF088529, BF752887, BF752876, BF830967, BF750902, BF827636, BF088528, AW384405, BF154912, BE073529, BC008429.1, AL121901.20, AL355392. 7.
HBIBW67	57	553678	1 - 1390	15 - 1404	AW197585, AW976010, AV762783, AL040921, AA601355, BF792326, AV760701, AI924251, AA362754, BG164166, AV760685, AF074667, AL120008, AW406447, BF677884, AW820127, AU144500, AV734607, AA526787, AW131249, AW102811, AV759172, AI038990, AL120269, BF968141, AU156861, AA837677, BG027041, AW961160, BG250302, AW473178, AW055226, AA837740, AU144814, AI282832, AL041013, AW965008, AV764250, AA722372, BF982222, AI744188, AW513569, AW820787, BE071877, AA224525, AW847118, AW513556, AW102955, AW473541, AU145239, BG177715, AA453558, AI674290, AV759798, BF678427, AW769399, AA938105, AL119123, BE071876, AA631507, BF694054, BF736198, BF965154, AA569284, AV691147, BE061906, AI374809, AV710996, AA524821, AI500454, BF877643, AI121815, BE798520, AV740801, BF965477, AI334443, AV733710, AA723287, AV655830, BE047069, AC011479.6, AC010363.6, U91326.1, AL159977.10, AC024163.2, AC068712.6, AC005911.6, AC020626.6, AC006483.3, AL137119.26, AC009137.6, AC005694.3, AL359552.16, AP001717.1, AL354707.17, AL035079.14, Z99716.4, AL008715.1, AC008543.7, AL139289.6, AL590762.1, AC005231.2, AC010618.7, AL121928.13, AC008764.7, AC005755.1, AC084865.2, AC009516.19, AC005529.7, AC008482.5, AC002350.1, AC008745.6, Z83840.7, AP000557.2, AC010654.8, AL163973.1, AC002073.1, AC007226.3, AL354864.16, AC008753.8, AC005527.3, AC005399.19, AP001748.1, AC020750.3, AC006511.5, AC008687.4, AL121594.6, AC020915.6, AC011491.5, AL133174.15, AL035367.5, AC0090939.1, AC005209.1, AC010877.3, AP001714.1, AL133245.2, AF334404.1, AE006639.1, AL353692.14, AL161452.19, AL355517.12, AL096841.6, AC010422.7, AC008610.6, AC020898.5, AL031279.1, AL034380.26, AJ400879.1, AC007850.29, AL021579.1, AC022211.5, AL450224.1, AP001972.4, Z68870.1, AC008481.7, AL022721.1, AL136300.22, AL122035.6, AC009122.8, U95740.1, AC005081.3, AJ400877.1, AC006285.11, AC073138.3, AC005565.1, AC005071.2, AC003962.1, AC010899.8, AL354932.26, AL353812.13, AC004089.25, AC053467.1, AC078846.2, AC006130.1, AC005280.3, AC008736.6, AC008521.5, AC003101.1,

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HBMB51	58	963208	1 - 523	15 - 537	AI827239, AW104045, AL536345, AL096774.9, AL096774, AL096774, AL096774.
HBINS58	59	1352386	1 - 829	15 - 843	BF674706, AA657543, AV757289, BE139139, AI250552, AI251284, AI251203, AI284543, AI251034, AW674277, AI254770, AW303098, AA582073, AI249853, AC005696.1, AF045555.1, AC090514.1, AF243527.1, AP001725.1, U91318.1, AL121897.32, AP003357.2, AC008155.9, AC005081.3, AL132838.4, AC011470.5, AP000692.1, AL132640.4, AL109976.23, AL121992.24, AL135928.6, AL033529.25, AL353807.18, AC020916.7, AL138849.12, AC011247.10, AL158830.17, AP000501.1, AL008637.1, AC006270.1, AC011464.5, U95742.1, AC022384.4, AC011555.5, AL049795.20, AL033383.26, AC005921.3, AC012170.6, AC004922.2, AC007934.7, AC018828.3, AL121653.2, Z82215.1, AC022383.3, AL049636.22, AC007216.2, AC005971.5, AC005058.1, AC010431.7, AL135783.6.
HBIFU48	60	460392	1 - 835	15 - 849	

					AC044797.5, AP000355.1, AL121928.13, AE006462.1, AL590682.9, AL451083.5, AL162724.16, AC004906.3, AC006312.8, AL359272.9, AP001666.1, AP001716.1, AF111169.2.
HBJD05	61	1130660	1 - 1994	15 - 2008	BF507343, AI830176, BE777697, AL134817, BE466375, BE536137, BG033415, BE770976, BF665352, AI141799, AI333231, AW083069, BF674917, AI819484, AW291130, AI693686, AI139569, AI765217, C05997, AI191712, AI360840, AW403076, AA830242, N23996, AI707975, AI360845, AW746530, AI743353, BE675302, N28536, AA737061, AW405631, AI864662, AI627462, W31857, AI492266, AW589350, AI581705, AI624651, N34736, AI860242, AA181897, AI811985, AV682516, AA812089, AA768170, BF589611, AI942262, BF572713, H99855, AI536025, AA612923, N67098, AA705383, AA082077, AA761491, AA884032, AA442783, AW977117, H00904, AW770178, AI796455, BF571118, H00903, AI568136, AA682798, BF343253, AI926340, AW591358, T91642, BE887851, BE693611, N28620, D63124, AI432722, T91587, AI740627, AL513907, AL513597, AL514791, AI433157, AL514063, AL513977, AL515413, AL513553, AL513693, BG179993, AL514627, AW087445, AI613017, AI580190, AI469532, AI702433, AL513631, AI539153, AL514691, AL045500, AL513999, BE018334, AI934035, BG260037, AL514919, AI538716, AL515191, AI564719, AI572787, BF724198, BG252914, AL514303, AV758822, AV758592, AI636719, AI687362, AI812080, AL515019, BG180996, AL036146, AL036361, AI583316, BG110797, AW169653, BF868489, AL513713, AI499393, AV756393, BE048131, BE966479, BG257535, AI524671, AW274192, AI815855, BG031815, AI446606, AI273142, BE620084, AA470491, AL514015, AW162071, AV758806, BG164371, AL514473, AL513643, BG109221, BF885675, AI687728, AI560099, AI536685, AL513911, AW301409, BG168696, BE964683, AI818683, AL514867, BE964006, BG109125, AV733397, BE967261, BF337043, AV756619, BG250190, AI281779, AV705644, AI653541, AI269696, AL514087, AI537244, BE966388, BF882343, AA640779, BF970162, AV682249, AL513951, BE964812, BE789764, AL119791, AV756026, BF792099, AI475455, AI702406, BF342070, BE965481, AW827203, AL514025, AL036802, AW827249, AV709517, AW238730, BF970731, AL121270, AA508692, AV756150, AI349933, AV755613, BE781369, AI570384, AI436456, AW188539, AV757018, AL135661, AI868831, AW075413, BG151247, BF724691, AI499131, AI54245, AI857296, AW002342, AI224992, AI573032, AW999049, BF817926, BE018711, BF792469, BG253026, AL514935, AI633419, AI498579, AI866002, AI349004, AI475451, AI433976, AI280747, AL036274, BE964495, BF795712, AL513803, BG036846, BE963035, AI610645, AI567351, AW268220, AI439087, AI439076, AV729890, AI521012, AI872711, AI934036, AV711924, AV706164, BF792767, AI492540, AI469811, BF971016, AI539771, AV757737, BF970658, BE965190, AI866608, BE964700, BE964633, AB014540.1, AL110154.1, AF134894.1, AK027131.1, AK025084.1, AB056420.1, AF090903.1, BC001967.1, AL049452.1, AB019565.1, AF090934.1, AL117460.1, AF090900.1, AL133640.1.
HBJY92	62	778065	1 - 2420	15 - 2434	

AL050149.1, BC008387.1, AB063070.1, AL133016.1, AL162083.1, AL359596.1, AF090896.1, AF146568.1, AL512733.1, AL136787.1, AK027868.1, BC008488.1, S78214.1, AB055303.1, AK026045.1, AL442072.1, AF090901.1, AL136892.1, BC008417.1, BC007021.1, AB055366.1, AL133557.1, AF104032.1, AF219137.1, AL442082.1, U42766.1, AK026855.1, BC008365.1, AL117457.1, AL359618.1, AL049938.1, AB049758.1, BC003687.1, AF090943.1, AL049314.1, AL136789.1, AJ242859.1, AF106862.1, AL137459.1, AF125949.1, AL136586.1, AB056768.1, BC003683.1, AL389978.1, AL110196.1, AL136749.1, AL080060.1, AB048953.1, AF218014.1, AK000212.1, AF111847.1, AF078844.1, AL122093.1, AL133080.1, AB063008.1, AB047615.1, AL050116.1, AL050108.1, AL050393.1, AB055361.1, AF091084.1, AL162006.1, AL110221.1, AL096744.1, AL050146.1, AL157431.1, AB052191.1, AL133606.1, BC006807.1, AB063046.1, AL136799.1, AL137527.1, AL122050.1, AK026741.1, AB047801.1, AK027096.1, AF097996.1, AK025339.1, AK026647.1, AL390167.1, AB060887.1, AK026452.1, AK026865.1, AK026608.1, AK025958.1, AL359601.1, AK000323.1, AB048964.1, AL133075.1, AL080124.1, AL050277.1, AL512718.1, AL080137.1, Y16645.1, AK024538.1, AL049466.1, AL137283.1, AL512719.1, AB060916.1, BC001045.1, AK000618.1, BC004556.1, AL122121.1, AK026533.1, AL133093.1, AL512746.1, AK000083.1, AL050024.1, AK026744.1, AL389982.1, AL117583.1, AL136768.1, AK025772.1, AK026784.1, X82434.1, BC002733.1, AB060863.1, AK025414.1, AB060908.1, AL133365.1, BC006195.1, AB055368.1, AK026086.1, AL137557.1, AB060912.1, AK000445.1, AK000432.1, AL049430.1, AF177336.1, AL136844.1, AK025092.1, AL133560.1, AL359941.1, AK027116.1, AK026642.1, AK026542.1, AB060825.1, AK026504.1, AL512689.1, AL122123.1, AK027113.1, AB060826.1, BC008485.1, AB052200.1, AK025484.1, AL117394.1, AF207829.1, AB048954.1, AB062938.1, AL117585.1, AF125948.1, AB051158.1, AK000137.1, AL512754.1, BC008382.1, AK026534.1, AL137550.1, AF225424.1, BC004951.1, AK025491.1, AK026927.1, AB055315.1, AL136928.1, AK026532.1, AK026592.1, AL110225.1, BC008899.1, AB060852.1, AL353940.1, BC006412.1, AK026959.1, BC002839.1, AL049382.1, U91329.1, AK026583.1, AL122098.1, AK00652.1, AB055374.1, AB056809.1, AL512765.1, AL050138.1, AL137648.1, AL137538.1, AL122110.1, AK026600.1, AL049283.1, AL512684.1, AK000718.1, AB047904.1, AL049464.1, AK027200.1, AB049892.1, X65873.1, AK024524.1, BC008070.1, AK025967.1, AK026353.1, AF260566.1, BC007199.1, AL359615.1, AL136845.1, AL136786.1, AB060929.1, AK024588.1, AL117435.1, AL137271.1, AB056421.1, AL049300.1, AL162008.1, AL359583.1, AF056191.1, BC008983.1, AK027204.1, AK027164.1, AK026630.1, BC008893.1, AK000647.1, Z82022.1, AL110197.1, AF183393.1, AL136843.1, AL162062.1, AL137463.1, AL512761.1, AK025906.1, AK026947.1, AL080127.1, AK025524.1, U80742.1, X72889.1,					
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HBJJU28	63	561723	1 - 1146	15 - 1160	<p>AL512750.1, AK025632.1, AL133072.1, AK026629.1, AK025391.1, AK026480.1, AI090576, T74524, AA572813, AI287766, BF821897, AL037632, BF725844, BF821009, AI619742, AI890348, AI821901, AA513551, AI473995, AA720702, BE138484, AI281881, AP001965.2, AC010319.7, AC007182.3, AC007956.5, AL138996.4, AL049553.20, AL121655.1, AC006141.2, AL109804.41, AL049776.3, AL035658.7, AP000512.1, AL122008.28, AC020983.7, AC013429.12, AC006064.9, AC004675.1, AL445222.9, AC027125.4, AC005500.2, AP001717.1, AL356379.10, AC009137.6, AF088219.1, AL445687.5, AL138759.20, AC007731.14, AB038653.1, AP000892.4, AL590762.1, AC011895.4, U63630.3, Z98044.13, AL354680.14, AL355984.11, AL050321.11, AC026672.44, AL049872.3, AF312032.1, AL139100.9, AL133500.3, AC006120.1, AC004965.2, AC004531.1, AC002310.1, AC020552.4, AF031078.1, AC013718.6, AL353748.13, AF030876.1, AC002073.1, L47334.1, AC006084.1, AC005081.3, AC018511.4, AC003108.1, AL137792.11, AL117381.32, AF031076.1, Z83826.12, AC010553.6, AC009309.4, AC004531.1, AC006130.1, AL049839.3, AC011465.4, AP000952.2, AC005996.2, AL022238.1, AC005911.6, AL031311.1, AC004846.2, AC005071.2, AC009314.4, AB023050.1, AC004212.1, AL135960.1, AJ131016.1, AL391415.12, AC009077.7, AC006483.3, AP002852.3, AL117338.15, U89335.1, AL008726.3, AC009363.4, AC005899.1, AL034405.16, AL450339.5, AL360230.20, AL122035.6, AL022163.1, AL139318.9, AC008753.8, AC002425.1, AC008569.6, AC004796.2, AC009509.7, AL050306.5, AL121808.4, AL121886.22, AC005531.1, AC003982.1, AL354760.11, AC011464.5, AC004671.1, AC004973.1, AC005138.1, AL139274.17, AC073341.9, U91323.1, AF053356.1, AC008392.6, AL117344.12, Z95113.2, AC008623.4, AC004820.2, AL158830.17, AP001670.1, AC004079.1, AC002400.1, AC011462.4, AP000501.1, AL445071.14, AC005015.2, AL031295.1, AB003151.1, AC005527.3, AL022320.23, AL031432.1, AC005409.1, AL121673.41, AL121586.31, AL133332.12, AL117692.5, AC004985.2, AL021707.2, AC011455.6, U95742.1, AC009570.13, AF238380.1, AC004862.1, AC007637.9, AC004878.2, AC004876.2, AC009247.12, AL355480.22, AC010543.8, AC006241.1, AL035417.15, AC004867.5, AC090426.1, AF207550.1, AC007216.2, AL355392.7, AC021188.6, AL589723.7, AF165926.2, AL078581.11, AC007649.12, AL121653.2, Z82215.1, AE000658.1, AC002126.1, AC040160.4, AL118501.22, AC005080.2, AL133507.8, AL020997.1, Z92542.2, AL450226.1, AC018633.2, AL352978.6, AP000500.1, AL117336.22, AC007066.4, AC013355.7, AC018636.4, AC018808.4, AP001753.1, AC006013.3, AL031255.1, AL136162.17, AW962384, AW956292, AA631830, AV708590, AW964544, AV709418, AI814702, AV729132, AV726091, AA652816, AV657453, AW956077, AW962908, AW966634, AW963349, AV708167, AV703597, AV727065, AV703388, AV703232, AW961593, AV702425, AW961606, AW950632, AW963756, AW963609, AV701873, AW959734, AW962444, AV707331, AL525316, AV703761,</p>
HBJLC01	64	638410	1 - 858	15 - 872	

						<p>AV729517, AV726754, AV707276, AW961313, AW963348, AV705525, AW962942, AW963583, AW966270, AV708720, H60864, AW950748, AC004033.3, AC007050.25, AC008745.6, AC005500.2, AP000502.1, Z94801.1, AF019413.1, AC005261.1, AC005332.1, AC025588.1, AC006372.2, AC008265.15, AL590763.1, AL359235.3, AP000789.4, AC005476.4, AC079602.15, AC009789.21, AC018638.5, AC024952.4, AL022318.2.</p> <p>BG261130, BG121213, BF347966, BF796462, BE899286, R17115, AI123525, AI697325, BE783654, AW402585, AO32055, BF724098, AO31919, AW402594, AW402872, AW026287, W89010, AI926967, W95778, BF887406, AI376419, BF381332, BF507805, BF888120, AA233002, AI669291, AI963299, BF744292, BF907549, BF907541, AA954836, BF888127, AI768850, AA768759, BF888128, AA232951, BF744299, AW090314, AI571824, BF888074, N73038, AA480645, N53675, AA886377, BF888119, AA535561, AI864506, BF799491, AI217778, N51612, BF381336, N53906, BE819619, AI806785, BF744934, W95735, BG251027, BF381311, AI674508, AA016130, AA743705, AA917873, AA649797, BF887394, AA631017, BF907590, AI480218, AW302053, BE139664, Z39059, H86222, AA954334, AA456896, AI244571, AA015836, AI341715, AA485019, AI078627, AI015866, AA827439, BF745018, AW271993, AA954612, AW001670, AK000208.1, AC011005.7, AC083866.2.</p> <p>AA830383, AA465482, AA731000, AA815064, AI632903, AW576518, AA847860, W84413, AA210914, AW341113, AA721650, AA488009, R45299, AW873717, AI693003, AW977787, AI283768, AI127928, AI148391, BE048487, AA417947, AA236463, AI671420, AA836581, Z38691, AA811097, AW471001, AA210913, AI500017, AA709242, AA418189, AI92414, AA234646, AW956166, AV703593, AW950675, AW963117, AV706278, AV701983, AW954129, AW965551, AC013414.7, AK026400.1.</p> <p>AW007501, AA902287, AI838092, AI005351, AW959933, BF342564, AW083940, BF820646, AI870864, AW960414, AI032697, AW149115, AA829811, AA709070, AW264612, AA643392, AI951841, AA614344, AI312642, AA533443, BF850030, AI799536, AA991955, BG222284, AI830766, AA594172, AI289881, AI741805, AI276207, AW088660, AW268666, AI749660, AI369678, AI264768, AA625243, AI816740, AI190367, AI510691, AW168615, AI817506, AI792359, AV695532, AI291890, AW089929, AI268176, AA617718, AI609047, AI913963, F34379, AA985480, AI282722, AI394498, AA864826, AW050814, AW800132, AI494152, AI868440, AW800119, AA991995, AA937062, AW129114, AA877343, AW594090, AI335628, AA335122, AA737786, AI708280, AA642608, AA318733, AI245599, AW054951, AA603928, BF877450, AI074177, AA936631, AA569858, AW080143, AI768186, AA995511, AA317892, AI718073, AI915027, AI963480, BF820659, BF913950, AA318753, AA345519, AW796949, AW800259, AV714865, BF755228, AI291076, AA335136, AI340221, W87494, AW083985, AI739187, AI830861, AI351218, AI266613, AA779248, T53694, AA335121, AI950591, AA746624, R23643, BE826140, AA804997, AA740560, AI749854, AW148663, BE773353, AA961830, BF810637, BF810673, BF813070, BF812010, BF813049, R35066, BF945171, BF813054, BF813079.</p>
HBILF01	65	732111	1 - 1918	15 - 1932		
HBILH40	66	828130	1 - 1839	15 - 1853		
HBINC59	67	1125802	1 - 1047	15 - 1061		

				<p>             AW168417, BF810677, AI299182, BF813063, AA878942, BF810666, BF810872, AA983420, BF813082, AA367958, BF810669, BF810657, BF811989, BF810652, BF813065, T53693, BF813069, BF813073, BF813052, BF813066, BF810672, BF813053, BE826066, BF094201, BF813085, AA804991, BF812479, BF811996, BF812002, BG151300, AI198965, BF813100, AI913330, BE826068, BF849490, BF812030, BF812029, AA862333, AA632062, BE965724, AW084151, BE900751, BF815930, AI570169, AI281867, AI345416, AI345612, AI345415, BE891834, AV756343, BF911517, BF339322, AI950664, AI335426, AI348777, BG166654, AV746955, AI554821, AA464646, BF904192, AI690813, AW083572, AI249946, BF840692, BE967104, AI045421, AI890907, AW193467, AI277325, BF025791, BF812936, AW263569, H89138, AI514763, AA641818, AV709679, AI491916, AW005612, AV682150, AI633125, AV746964, BG104819, AW827289, AI538850, AL046942, AI185535, BF812963, BE906419, AW827227, AI955906, BE895585, AW162194, AL048644, BE295833, AI114703, AI817244, BG029829, AI134712, BF885082, AW020419, AL039086, AI636619, AW168503, AA761557, AV744136, AI866469, BG032036, BF792099, AI515375, AI514829, AI568060, AI540606, AA830839, AI678446, AI823719, T99953, AI567582, BF792961, BF872670, AL038564, BE892296, AW105601, BF911528, AF135157.1, AF260332.1, BC008983.1, AI137461.1, AB052176.1, AL049452.1, AF217966.1, BC008078.1, X53587.1, AK024538.1, BC007375.1, AK000647.1, AI122106.1, BC007198.1, AI136850.1, AI136844.1, AF111847.1, AL389935.1, AF348209.1, AL353625.5, AK027081.1, BC008280.1, AK026556.1, BC001655.1, BC006133.1, AI137548.1, AF205073.1, AI157431.1, AL050170.1, AF230496.1, BC000550.1, AF132730.1, AF061573.2, AL080074.1, AF218031.1, BC001785.1, AF242525.1, AK024570.1, AK026408.1, BC004899.1, AK025208.1, AF183393.1, AB050431.1, BC002466.1, AF058921.1, AI583915.1, AI133010.1, AF026816.2, BC004222.1, AK023339.1, BC004362.1, AI136768.1, AF162270.1, BC004905.1, AI137476.1, BC003569.1, AI122110.1, AI133014.1, S78453.1, AB048888.1, AI162003.1, BC002519.1, AI389957.1, AF106697.1, BC004908.1, AI137539.1, BC003515.1, AF218005.1, BC002631.1, S76508.1, AB055290.1, AK026593.1, AI136799.1, BC003687.1, AB063088.1, AK026526.1, BC009294.1, AI137537.1, BC006164.1, AI137530.1, BC003610.1, Z82022.1, BC008485.1, BC007767.1, AI136754.1, S77771.1, BC002491.1, AF239683.1, AK024524.1, BC003052.1, AF003737.1, AK026522.1, AB060837.1, AF094480.1, BC008417.1, BC008751.1, AI133049.1, BC002733.1, AK026532.1, BC008365.1, AK026542.1, AF169154.1, BC003410.1, AI136928.1, BC001236.1, AF073483.1, BC001328.1, BC006480.1, AK026947.1, BC007641.1, AI122098.1, AI133016.1, AI353940.1, AB063077.1, AB047904.1, AK024622.1, BC003695.1, AY034001.1, BC005678.1, AI133637.1, AI359624.1, AF353396.1, BC008070.1, AB062942.1, AB050410.1, AI133640.1, AL080154.1, AB063074.1, BC006410.1, AB060916.1, AK025632.1, AI137558.1, BC007534.1, AI122118.1, </p>
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					AL389982.1, AJ012755.1, AF022813.1, BC009033.1, X76228.1, AL512754.1, AK026626.1, L30117.1, AB050533.1, AB048954.1, AL137538.1, AK027164.1, AB049880.1, AB060839.1, AL359601.1, AL136864.1, AL136787.1, AF285167.1, AL137665.1, BC004943.1, BC001418.2, Y14040.1, AL359583.1, AB047930.1, AK025798.1, AB060903.1, AK026038.1, AK025484.1, BC004944.1, AL080148.1, AL137641.1, BC001470.1, AB049848.1, AF078844.1, BC002457.1, AF358829.1, AF245044.1, AL136845.1, AB063070.1, BC002798.1, AK027113.1, AB060873.1, AF143723.1, AF218006.1, AF114818.1, AB060929.1, AK027204.1, BC001963.1, BC005160.1, AB063079.1, BC009253.1, AL137256.1, AK026924.1, AJ010277.1, AF321617.1, AK027114.1, AK027136.1, AL050138.1, AK002467.1, AF271350.1, AL357195.1, AL080110.1, AJ242859.1, BC004395.1, BC008717.1, AL117460.1, AK027160.1, AK026855.1, AB055303.1, AB060887.1, AF090900.1, S69510.1, AK000206.1, BC000556.1, AF308800.1, U91329.1, BC004950.1, AK000247.1, BC009284.1, AB060897.1, BC004370.1, BC006103.1, AF151109.1, BC004951.1, AL050172.1, AF305835.1, AK025573.1, AL137574.1, BC005843.1, AK026649.1, U57352.1, AL117629.1, BC002454.1, AL137488.1, BC000348.1, BC008930.1, AL359941.1, BC000051.1, AL133067.1, AL137556.1, BC004945.1, AB051158.1, BC007280.1, AL133558.1, AL389983.1, AL080159.1, BC005931.1, BC004530.1, AL137560.1, BC002355.1, AB060832.1, AK000636.1, AB049900.1, AK026885.1, AB060863.1.
HBNW17	68	526797	1 - 587	15 - 601	AA713518, AA807610, AW104604, AA830415, AW975518, AL138824.19.
HBOEG11	69	1300752	1 - 1342	15 - 1356	BF056642, BF516162, AI807970, AI081658, AA861514, AI494148, AW448950, AI973060, AI400318, BF849398, AA385680, AW028539, BF847907, AA377456, F34025, AI472684, C01967, BF344191, BG251209, BF337896, AW079432, AI783808, AA649296, AI343030, AI334889, AW023871, BF107008, AI336565, BF911517, AW243767, BF874010, AW410046, AW151283, AL041230, BF911521, AV744830, AA836558, AL048644, AA769697, AI799189, BE892572, AW952403, AI933926, AW074057, AW020619, AA768214, BF154738, AF083500.1, AF100780.1, AF074604.1, AL139352.16, AF100781.1, BC002631.1, AK024855.1, AK024533.1, AB060883.1, AF001605.1, AF001699.1, BC001795.1, BC008895.1, AL136789.1, AL137461.1, BC008488.1, BC003105.1, BC005805.1, AB060828.1, BC005084.1, AC008897.7, AF125948.1, AL162085.1, Z49258.1, AL445220.5, AL049276.1, AK024570.1, X76228.1, BC002948.1, BC007371.1, AL096728.1, AL117590.1, AL080124.1, BC000199.1, AL109672.1, AF090900.1, BC005890.1, BC000895.1, BC002535.1, AL136893.1, AL512751.1, BC007417.1, BC002816.1, BC001328.1, BC002372.1, AB048995.1, BC008751.1, AL139352, AL139352.
HBOEG69	70	793786	1 - 1397	15 - 1411	AW576190, AA524064, BF701378, AI337569, AW058654, AW964434, BE568412, AW978965, AW241842, BE221243, AI346249, AW241843, AA825846, AA936562, AI184881, AI346396, AA570030, AW368546, AA465472, AW995507, AW361365, AV743550, W74158, AV750714.



HBXFL29.	71	842802	1 - 2215	15 - 2229	<p>H80936, BF879997, BF880246, AI144077, AV743963, AV740879, AI053597, AI222773, R95913, BF901243, AA318779, BF088361, D62291, R27740, BF767423, AI277044, AV743740, AI053934, AI310256, R27741, R08998, C00592, N64904, AA827757, AK024978.1, AC006146.2, AF147723.1.</p> <p>AUI24786, AI523480, AUI25638, AA608680, BF185800, AL135214, AI346426, AW369825, AV715627, BE044175, AA704114, AU148578, AI953494, AA102088, AA099340, AA875957, AA411819, AW103703, AI339566, AI610736, W27706, AA825903, AI934820, AU149251, AI080375, AU160262, R67711, N40031, AW901194, AA315231, N27293, AA401638, AI307801, AW589999, Z42700, AA382141, Z38860, AI382965, AA774224, BF816363, R62663, R43562, AI244553, AW118387, R62613, Z22885, T35989, R66107, AI204282, F10296, BF946792, BF944261, AA095193, AA093900, AI964066, AW576941, AW025279, BE048061, BG114528, AV759054, AV761957, BG105500, AI625444, AI679506, AB020705.1, AK022701.1, AK025648.1, AC005207.1, BC002697.1, AK026649.1, X99717.1, BC008365.1, AF260566.1, AL359932.1, AL137267.1, AB049849.1, AB047623.1, AJ401156.1, BC007347.1, AK027142.1, AY007109.1, AF285836.1, BC006287.1, AL049276.1, BC007034.1, BC009311.1, AF151109.1, U72621.3, AL390154.1, AF103804.1, BC003684.1, AL137479.1, AB062750.1, AK025391.1, AF093119.1, AK026642.1, AK000391.1.</p> <p>AW470141, AI540355, AI150724, AUI20416, AA547979, AI187148, AA287570, N32944, AA255853, AI802087, AW276458, BG009661, AI923052, AW976784, AA904211, BF805088, AI278972, AW269504, BF942976, BF939548, BF725844, BF944736, AV720367, BF920612, AA812058, AA410788, AA535216, AW069227, BG056362, AW965008, BE265787, AA425924, AA873573, AV719902, AW819125, AI634187, BF804385, AI445582, AA487475, BF965394, AI160786, AA742815, AI133514, AI608699, BF767878, AW023111, AI625604, BE139139, AI491765, AI457313, AI733856, AI250552, AI792521, AW969743, AA228778, AI279417, AA483606, H73550, AA570740, AUI47162, AW505253, F28204, BF857849, AI284543, AI889579, AI251034, AL527073, AI251284, AI251203, AA470512, AA315361, AW972919, AI679002, AV760019, AA568204, AI538236, BE645220, AA847508, AV695478, AI291439, AI884383, AL047467, BF968874, AI537995, AI130709, AA730305, N59569, AW968564, AI890324, AW674631, BF725761, AI223626, AW341978, BE138509, BG250286, AI679759, AI814682, AA847427, AV725627, AI889696, AI254770, AA456924, AA714110, AW805539, AI053688, AW575000, AW131417, AA832145, AI573198, BG230549, BE138594, AL041375, AC009511.16, AC005071.2, AC020913.6, AC005081.3, AC004166.12, AC079602.15, AC087071.2, AC005015.2, AC002472.6, AL138724.12, AC005098.2, AC005011.2, AC019206.4, AC009412.6, AC007664.12, AC018642.6, AC011461.4, AF053356.1, AC006064.9, AC004841.2, AC020908.6, AC011497.6, AC005562.1, AC005102.1, AC009079.4, AC027319.5, AC005080.2, AL136123.19, AL023693.25, AC006211.1, AC006312.8, U95740.1, AL031447.4, AC016776.6, AP001718.1, AC008569.6, AC004965.2.</p>
HCACU58	72	625923	1 - 1540	15 - 1554	

				AC004089.25, AL049830.3, AC007201.1, AC020934.7, AC005104.1, AC007956.5, AC025166.7, AC011449.6, AC073657.5, AC008753.8, AC004971.3, AC004531.1, AF001549.1, AL031276.1, AL137792.11, AC008155.9, AL44586.14, AC011489.6, AC004859.2, AC005484.2, AL096840.25, AP001753.1, AC004967.3, AP000350.1, US2111.2, AC000085.5, AC008760.6, AL157823.9, AC002126.1, AL050335.32, AL109984.14, AC072052.6, AL590762.1, AC005488.2, AC008946.6, AL161747.5, AC018758.2, AL135927.14, AC010319.7, AC011811.42, AP001710.1, AC007055.3, AC005529.7, AC022383.3, AC002300.1, AF134726.1, AL133367.4, AC006014.2, AL359382.23, AP001711.1, AL109623.9, AC007227.3, AJ400877.1, AP000501.1, AC018809.4, AC011491.5, AC009509.7, AC019205.4, AC009488.5, AC007686.5, AC009244.24, AP003439.2, AC004812.1, AP000045.1, AC008395.6, AL031283.26, AC011444.5, AC002288.1, AP001694.1, AL121891.22, AC005625.1, AC012476.8, AC020658.6, Z93015.9, AL109825.23, AL109797.18, AL160269.14, AL121586.31, AL049795.20, AE006463.1, AC003108.1, AL132639.4, AC007225.2, AL049872.3, AC020904.6, AC009267.15, AC018828.3, AC008403.6, AC008474.7, AC005972.1, AC002425.1, AP000116.1, AB043547.1, AC069262.24, AL354720.14, AC021188.6, AC083884.6, AC006088.1, AL121972.17, AC025593.5, AC011472.7, AC003029.2, AC011487.5, AC004966.2, AC005920.1, AL390738.4, Z82178.2, AC005288.1, AC004491.1, AC000025.2, AC004846.2, AC004167.1, AL109758.2, AL451125.7, AL139390.15, AL136137.15, AC008481.7, AL354928.9, AL136418.4, AL139054.1, AC006480.3, AC018663.3, AC008738.6, AC007003.4, AL050318.13, AC004638.1, AC011514.3, AC004883.2, AC005231.2, AC005736.1, AC005702.1, AC009996.7, AC010326.6, AC008521.5, AL049569.13, AC008440.8, AC004834.2, AL022396.1, AC018711.4, AC005520.2, AL078461.38, AC074121.16, AL121905.23, AL022318.2, AC010494.4, AC027125.4, AC005971.5, AC005000.2, AC008551.5, AC011464.5, AB003151.1, AC008556.5, AL139316.5, AB026898.1, AC018738.4, U91323.1, AL049761.11, AC007386.3, Z84466.1, AC010422.7, AP002852.3, AP001725.1, AC018719.4, AC008635.6, AL109935.39, AF047825.1, AC007850.29, AF109907.1, AC004000.1, AC011484.4, AC020906.6, AC018751.30, AB038653.1, AL133545.10, AL008719.1, AL139396.17, AC005412.6, AC005778.1, AL121825.19, Z95152.1, AC024163.2, AC010092.4, AC006441.13, AC004826.3, AC044797.5, AL132780.5, AC005522.2, Z95115.1, AC020663.1, AL138756.23, AC011465.4, AC002312.1, AC022384.4, AL035086.12, AC083855.2, AC012512.7, AC008755.6, AL163032.3, AC000360.35, AL354864.16, AC016830.5, AC007731.14, AC004876.2, AL109628.5, AL034549.19, AL137073.13, AC004873.3, AC005086.2, AC006329.5, AL035659.22, AC011480.3, AC002565.1, AC015982.9.	
HCACV51	73	1306706	1 - 2069	15 - 2083	AL521141, AL521142, AL524128, AV695196, AV694072, BF338443, BG114245, AV689975,

					BF670146, AI760812, AV723814, BF574966, AI633691, AI907541, BF528015, AI743976, AW006271, BE549523, AI700393, AA115333, BF448307, AI768614, AI378849, AA131998, AA131832, N66024, AA151271, AI129857, AV704651, AI091145, AW380450, AI269749, AA172168, AV724434, R54280, AA172321, AV724565, AI867173, AI300863, AV760041, R54285, AA151270, AI286118, N95138, AA582838, AV647292, BF887566, H13107, Z44149, W37854, BE002303, R97002, BF665270, BF931446, H06694, AV694980, R95925, H67104, AV692112, BE165279, H71324, R23855, H67641, AA223592, W37842, R51892, AI620275, BF185415, AA115245, AI638273, T16792, T34309, AI570769, R58781, Z45647, H06695, T32678, AI241920, AI382722, BE348480, D79743, BE139490, H13108, BE927649, F06574, BF351298, BF976915, BE827609, BF931447, Z40141, F05407, AI200985, F02843, R24487, BE165298, C05965, AL008639.15, AL512348.8, AL009182.17.
HCDBW86	74	520435	1 - 716	15 - 730	AL138679.11, AF063823.1, AF063822.1, AF175406.1, AF063825.1, AF063824.1.
HCEIQ89	75	520329	1 - 849	15 - 863	AA161299, AU144143, AI825905, AI354376, AW081897, AW129576, BF811204, R94288, AA720732, AI431303, AI281881, AW276817, AL119691, AA525127, AW080811, R71981, AW103758, AV763540, AW472872, AV763195, AW731867, AW960468, AI307201, BE047069, AL038606, AI635818, BF827410, AV755677, AI754253, AW020992, BG222267, AA488746, AI654247, AI345654, AW162288, AI457397, AI886629, AI355224, AV728928, AA846935, AA469327, AW501687, AV759580, AW265393, AV761403, AV761188, AV761608, AW304805, AW023672, AA491960, BG177307, AW189068, AI821714, AI792133, AI791913, AV658631, BE046438, BF885741, BF677892, AV735495, AI160117, AV760207, AI587583, AI587565, AI696962, AL138455, AV758994, AA829225, AL038842, AA642053, AI345518, BF851403, AV742057, AW167372, AA584581, BE301175, AI357823, AA551552, BE393367, AI821785, AI434695, AI696793, AL043578, AA847499, AV761498, AI087133, AI289447, BF740673, AW088846, BG059314, AA579179, AL120343, AL047427, AV761317, AL037683, AI733856, AK021483.1, X55926.1, X54181.1, X54175.1, X55922.1, X54178.1, MI3254.1, AC008521.5, X54177.1, U18399.1, AL135749.3, X74558.1, AC073138.3, AC005180.2, M87919.1, AC007395.3, AC005303.1, AF015147.1, AC016894.7, AC005823.1, AK022114.1, U95740.1, AC020904.6, AC010616.5, AC073898.1, AC024168.4, U95742.1, AL031650.22, AC007676.19, AL121906.18, AF015166.1, AC006006.2, AC090514.1, AC010605.4, AC013717.8, AL449305.4, AC002312.1, AL356378.17, AC006012.2, AC016587.7, AC006038.2, AC010150.3, Z94722.1, AC068919.4, U49740.1, AC002369.1, AP000556.2, AL117692.5, AC020934.7, AC005785.1, AC002350.1, AC006130.1, AL157791.4, AC023471.4, AL157938.22, AL137792.11, AP001725.1, AC004841.2, AC004816.1, AC007216.2, AL034555.2, AC011495.6, AC007957.36, AL034380.26, AF015148.1, AB025285.1, AC006141.2, U91326.1, AC020558.4, AC015651.18, AP000811.4, AC002563.1, AL390298.13, AC011491.5, AC084865.2, AC008958.6, AL138787.11, AL353193.7, AC018926.10, AL136313.27, AC004873.3, AL512885.4, AC006538.1,

					AL049759.10, AC004021.1, AC008848.7, AC006441.13, AF238375.2, AC004231.1, Z99128.1, AC011464.5, AC020931.5, AC000353.27, AC005324.1, AC005484.2, AL353588.25, AL450224.1, AC004876.2, AC006036.3, AC007390.3, AP000557.2, AJ009611.6, AP000744.4, AL590762.1, AC020659.5, AC010506.6, AP000552.1, AP000275.1, AC026172.3, AL022329.9, AF053356.1, AC068713.8, AP001858.4, AJ236701.1, Z82190.1, U80017.1, AL450226.1, AC010730.11, AL132639.4, AC008622.5, AC006132.1, AC004596.1, AL160165.17, AL390239.16, AC023490.5, AL049776.3, AL445201.14, AC008755.6, AL121905.23, AL121992.24, AL138724.12, AL109628.5, AC007842.1, AC001531.1, AL109976.23, AP000037.1, AP000105.1, AC018719.4, AL078584.17, AP001677.1, AC006484.2, AC044797.5, AC020983.7, U95743.1, AL133318.11, AL109984.14, AB000882.1, AC067722.21, AF241727.1, AL121751.12, AP000289.1, AL133367.4, AL121655.1, Z94802.1, AC004797.1, AL022316.2, AC006238.1, AP001867.3, AL355392.7, AC008754.8, AC005020.5, AP000042.1, AP000110.1, AL096791.12, AC004941.2, AC005412.6, AC006578.5, AL096701.14, AC007917.15, AL359513.12, AC009244.24, AC020750.3, AC006080.1, AC004659.1, AF141308.1, AL096765.12, AC005332.1, AL139109.14, AC004463.2, Z84467.1, AC006285.11, AP000692.1, AC010422.7, AL021391.2, AC009516.19, AC004990.1, AC005050.2, AL530657, AL534642, AL519887, AL519439, BE257752, AA769913, AL609266, BE674973, AI652143, BG057242, BE046399, AI669608, AU157638, BF347064, BE046435, AI571552, AA406626, AI634414, AW731848, BE245626, AI372990, AW473891, AU153165, AA969877, AI458122, AA402109, AU157487, AI815017, AA936365, AA481847, AI052565, AA704608, AI860561, BE736308, AI591232, AA425187, BF685966, AA479747, AI922541, AA889587, AA992245, R47377, AV694506, AA707462, AA283778, BF589042, AI767815, AW439290, AI354234, AW630387, R82068, BF829195, BG152634, AA229272, BE246763, AI745410, AW074728, AI867440, AA405028, AI652744, AI799388, AW732540, AA724063, AI249812, R43967, BE247615, AA229721, AA290883, AA477093, BF847615, AW117313, AA425298, AW804421, AV661367, AW627358, AA456146, W45494, R82878, R82020, F35061, H01485, AW014040, F25139, AA339640, AI961334, AA478233, AA362857, AA326205, BE244646, AA229827, AA377429, AI186501, BG008599, BE242784, T32225, AV686564, AA688260, AI085847, AV686569, BE157547, AA860204, R08559, F09429, AA405272, BF845336, BF380796, BF380795, AI860044, AA883556, AA032260, AA332516, AA402982, AA332325, BE157532, AA336006, Z39018, AI695855, AI589935, AI583010, AI954634, BF841145, AW469249, F04759, AA032193, F04962, AI524382, BF922668, BE157535, H01586, AI298047, T89862, AL530658, BF883965, BF374266, M78413, BF883968, AW197535, AW952615, BF847600, AW007397, BE157466, AI907687, AI632570, AL519888, AK023173.1, BC007642.1, BC007864.1, BE740754, BF339727, BE740538, BE277589, BE382940, BE618822, BE793142, BE390135, BF530091, AW969581, BF315345, BF340007, BG164152, BE618316, BE277504, BE740158,
HCE2F54	76	634016	1 - 1262	15 - 1276	
HCE3G69	77	728432	1 - 2070	15 - 2084	

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HCEE88	78	634967	1 - 1002	15 - 1016	BF666340, BF668771, BF038305, BF668077, AW119029, BF667069, BF701499, AW055208, AW957265, AW028072, BF691900, BF668648, BF694118, AV702373, BF028807, BF700043, BF667234, BF666974, BF695531, BF669352, BF699923, AI660615, AI131153, AI808050, BF698529, BF667444, BF696013, BF691594, BF028567, BF667757, BE958157, BF698385, BF667519, BF677631, AW070461, AA931899, BF207636, AV699981, AA736564, BF694116, AV745882, BF590086, AW043986, AA449497, AI688569, AI127387, AA580705, BF701312, BE958345, AI298725, BE275469, AV745310, AV748134, AI276928, AA629396, BF694297, BF696490, BF669542, AV735843, AV745499, AA705895, AI400291, BF696686, BF666126, AA603429, BF208365, BF577360, AI434989, AI218240, AA747345, BF431843, BF669182, AV745777, BF697596, AA811879, H49785, AW627840, AA449068, AI914366, AA351998, AI276926, AW118933, AI570369, BF670102, R11132, AV684667, AV684669, AV753487, AA720535, H49541, AV685783, AI130874, AA740850, AA348713, D62207, C75286, AI133132, AA301406, BF701724, R82112, AB037164.1, AF216305.1, AP001727.1, AP000009.2, AP000150.1, AF237812.1, AB037163.1, AK026311.1, AB035745.1, BC005180.1, AB037162.1, AB035742.1, AB035743.1, AB035744.1, AP001431.1, D83253.1, AP001429.2, AL034549.19, AB039659.1, AP000704.2, AP001435.2, Z98213.1, Z98249.1.
HCEFB69	79	748245	1 - 1416	15 - 1430	AL533253, BE735407, BE616472, BE615619, BF347687, BF967233, BE615232, BE294015, BE294088, BE255192, AW976142, BF541528, BE383692, BE615138, BE385645, BF672705,

BE389860, BF029472, BF694848, BE728074, AL520510, AA054608, BF348256, N53324, BE735149, BF972030, AL533220, AA021118, AA057005, AV756491, AW023111, AJ792521, AI792499, AI440117, AV763026, AV763058, BF725844, AI380617, AI345132, AA297145, BE138509, AA833875, AA833896, AL079645, AV703785, AW500684, AA483606, AW969667, BG000961, AA570740, AW079761, AI476049, AA904211, BF678990, AI053793, BE560149, AI755214, AA568204, AA602557, AI053688, AI754105, AI754567, BE968744, N23504, AI037897, AA171941, AI753037, AI366902, BF680286, AL035423.4, AF078544.1, AF155810.1, AF155809.1, AF155811.1, AP001972.4, AL137073.13, AC004622.1, AC007739.2, AC006512.12, AC007546.5, AC074121.16, AC010618.7, AC004840.3, AC005952.1, AC020552.4, AC010530.7, AC008622.5, AL021154.1, AC004815.2, AL135927.14, AC007227.3, AL122015.17, AL121891.22, AL391262.3, AP002981.2, AL035088.1, AC039057.8, AC007226.3, AC002367.1, AL033383.26, AC027319.5, AC022083.6, AC007957.36, AC003982.1, AP001631.1, AL159168.15, AC004659.1, AC008946.6, AE000658.1, AC009497.3, AL031985.10, AC010149.8, AC009247.12, AL137026.21, AL031311.1, AC011247.10, AC008753.8, AL133448.4, AL049760.26, AL132780.5, AL138976.5, AC005899.1, AC068724.7, AL139384.16, AL136418.4, AL139054.1, AC079468.3, Z97632.1, AP001712.1, AL031602.14, AL445184.11, AC016643.6, AL137141.10, AL137162.25, AC004144.1, AC005046.3, AC004832.3, AP000240.1, AL121890.34, AC020983.7, AC008896.5, AL031680.20, AC015982.9, L44140.1, AC006285.11, AC005261.1, AP001748.1, AL033529.25, AC018720.5, AL117694.5, AL109804.41, AC004975.2, AL137229.4, Z83840.7, AC011462.4, AL035587.5, AL022334.1, AC002301.1, AC026464.6, AC068999.15, M89651.1, AL049759.10, AC005666.1, AL117341.26, AC007664.12, AC008635.6, AL356481.16, AC018828.3, AC009001.7, AL158040.13, AC007421.12, AC009480.4, AL050335.32, AC005342.1, AP001694.1, AL157938.22, AC007536.9, AL136305.14, AC011443.6, AL032822.1, AJ300188.1, AC008745.6, AC011465.4, AC007934.7, AC004963.2, AL161893.24, AC020947.6, AL359236.4, AC008372.6, AC005815.1, AC008962.8, AL135838.5, AP001718.1, AC012076.4, AC068799.14, AL359986.15, AC020908.6, AC003110.1, AL109627.18, AC008623.4, AL157823.9, AL354750.12, AC009068.10, AL133367.4, AC005255.1, AP002898.1, AC018636.4, AC016026.13, AC005828.1, AC007637.9, AL391139.19, AL132855.4, AP000503.1, AC006211.1, AL121675.36, AL121972.17, Z95331.2, AC005901.1, AL159159.21, AL132773.14, AL138885.21, AL109865.36, AL121586.31, AL136525.17, AL391827.18, AP000744.4, AL161670.4, AC006023.2, AL391122.9, AC006433.18, AC000353.27, AC074338.1, AC008569.6, Z93023.1, AC009087.4, AC004019.20, AC002306.1, AC083867.4, AL035697.19, AC005859.1, AL359092.14, AC090517.2, AC011450.4, AL139316.5, AC009412.6, AP001705.1, Z85987.13, AP000514.1, AL352978.6, AC006241.1, AL159191.4, AP002852.3,				
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HCEFB80	80	1143407	1 - 2480	15 - 2494	BF343021, BF339312, BF341481, BF967606, BF344530, BF344213, BF513319, AL393526, BE857064, AW016800, AL937454, AL370995, AW170034, AA416907, AW044650, N75664, BF341415, AW960857, BG222497, AA703765, BE855450, AU146334, AA703342, N64813, T23840, AA446784, AA228781, M86149, T08275, AA386225, AA417008, AL671567, T15689, AW128975, AA432098, H83023, M85314, AL277779, BG222958, BF923571, M79106, BG152559, R13095, R11764, R21361, BF921573, F05369, T28040, T10247, AA323697, AL361427, AW235399, AL352392, T10246, R37689, AW594074, R40527, H82804, N59328, BF894586, R46460, T15861, BE672078, C14288, D25217.2, AF319633.1, AL022327.17, AL022327.
HCEGR33	81	425212	1 - 1616	15 - 1630	AL204978, AL217542, T95193, T95093, AA179147, AA526099, BG056362, AL516659, AL049829.4, AC013449.8, AL355101.2, AC073542.4, AC007298.17, AC012592.10, AL138758.7, AC079316.15, AC005399.19, AC020629.6.
HCEMP62	82	684780	1 - 1846	15 - 1860	AL520667, BF689505, AW953641, BG168504, BF343502, BE747867, BE737374, BE734304, BE514593, BE378257, BG179655, BF982990, BE909615, BG058649, BG115902, BG029850, AL688113, BE870978, AL554392, BF689070, BF690427, BE546131, AA911109, AW173438, AW382483, AA486370, AA778384, AL382028, AA776265, AW580475, BF74009, AA563686, AL493765, AL523553, AA484857, AL362311, AA811238, AA906681, BE047437, AA838288, AA460659, AL276177, AW404956, AW752131, BE763979, AA479791, BG029140, AA259052, AL097482, AW580486, AL082243, AA488079, AW510339, AA088205, AL609703, AL093069, AV683434, AW438882, AW366250, AA477188, BE141358, AL350871, AL953839, AL033274, AA285058, AA648139, AL087234, BE141360, AA226399, AA594766, BG006416, H03363, H53631, H04050, AL298774, BE141357, T86181, AL687929, AL270613, H48473, AA496296, BE185788, H53672, BE743169, H70534, AL433271, R99170, AW188898, AA359247, BF359882, AA374856, R23345, H28080, R70772, R33920, AL500391, AA852639, R81465, AA297085, BE543413, BE872231, T83919, BE141344, AA428830, R33033, AA297469, AW088943, AA621048, BE832975, AL400220, AA853069, R81663, AL963710, BF748942, R23264, BE259832, AA290677, BE163434, BE163435, AL687795, AW027045, AL289188, AA808274, AW074305, AA290975, AA461006, AA297403, R26089, AA226370, AA297468, R23497, BF000386, AA359017.

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HCENK38	83	658737	1 - 1495	15 - 1509	BG178033, BE896063, AV722833, BE907276, BE277857, BF952019, AA521308, AW182868, AA908959, AI628880, AW173363, AW665845, BE870003, BE761238, AI151418, BF996707, AI818267, BG180581, AI653663, AA001203, BE150445, R78710, AA130178, W03542, AA746655, AI828924, AA001202, AI961323, BE277870, AI093113, AI377976, AI951984, AI635625, AI624029, AI418242, AW088095, AI346936, W92652, AA130170, AA024605, W60401, N53543, AI207798, AA969140, AV706224, AA206833, AA862855, AA883077, AW173095, AW467519, BF830518, AI890288, AW952261, AA676671, R76291, AA641764, W60310, AI536758, AA742467, W92685, BF830522, C01747, BF029590, AW273508, W72474, AL047508, AI863984, W46673, AA928559, H97873, W46482, AA969604, T17266, W92828, W94587, BF963436, AA024606, AA973624, R61420, BF107415, AI932612, W76228, N72501, BE147741, AA160170, AL247642, AI499771, AW582120, N92375, AI803849, C04881, AW192182, N67695, R76925, AV728500, BF906742, AA641806, AW601191, BG104607, H00789, T31087, R61378, BE706416, AL047509, R78711, R76567, AA564390, AA992073, C15162, AI187944, AW779277, H39236, AA812071, W61163, H85007, AA733042, W61229, AI016971, H81599, H97053, R78466, H86612, H85630, AV713546, H90060, H86032, R78534, AW952259, AW889353, AA021401, AI540906, W24617, R62435, AA714924, R48455, H00689, H81598, AA918680, BE903841, T08911, BF834059, AA501896, BG106391, R40305, H86526, H85633, AA021275, R21120, H85004, AA774992, AI834279, AW970014, BE140906, N56017, AA573996, AI300746, R13223, Z43839, AI834298, AA094627, R85725, AA600097, AI475228, AI834286, AW380821, H85894, AA573651, BE843503, T32504, AA010588, AW380818, BE881856, AI879932, AA992769, D55263, AA829059,

HCEWE17	84	941941	1 - 953	15 - 967	AW770059. AI310325, AI022447, AA693896, R83833, BF819760, AI925934, AF193807.1, AY013268.1, AY013267.1, AL139130. T51653, AW168798, BG059728, AW151307, AA189081, AL133942, AI924175, AL10776, AI034217, AI479035, BE165748, AI811494, AW090210, AA346162, AW167452, AI687804, AI749571, AA470572, AW089655, AI197934, AI827133, AU144339, N64574, AA470493, AI697247, AI937684, N76274, AI984510, AL047920, AA223830, AA493998, BE176566, AV730063, T62931, BE148908, AA876415, AI801377, AW589501, AA085707, AW177317, AI439860, AI813517, AA581340, AI858607, AA099491, AA613244, AI887321, AA643785, AA633390, AU143906, AV719347, AI362951, W58428, AU146966, AA847621, AI564253, AI921101, AL041417, AA643823, AI567544, AI733077, AW177120, AI561208, AI264673, BE158597, AU145674, AA130536, AA694579, N74502, N54295, AW440317, AF063514, AU119100, AA873103, AW177237, AA160519, AA197059, AW177231, AW177264, AA598786, W49501, AA911409, N26540, BE264670, AL036881, AU146974, AA493751, AW994225, C17730, AA724159, AU145383, AA157033, AA041332, AA166854, H96719, AA055654, H65500, AA219480, AU148220, AI935333, AL523955, AI132962, AW084901, N48690, AI862874, D29455, AA376984, AI951835, AA101456, AA503213, AA440351, AI735074, AW177266, BE904846, AA846188, AW177226, BE152426, AA493735, AA593081, AW615437, AI538654, AA404968, AW813744, AA669580, F03370, AA350922, AA356989, AI421079, AV728282, AW771706, N76124, AI189033, AA584498, AI961771, AA953572, AV719696, AA467957, H04879, BE159220, T69889, AV720543, H97020, AA467904, AW074001, AF282520.1, AC073310.7, AK026100.1, AL030995.1, AL445236.22, AC023160.31, AK027219.1, AC003977.1, AC008945.6, AJ271735.1, AC012172.6, AL161415.2, AL139125.18, AC002217.1, AC023892.35, AL512629.7, AC069228.26, AC011998.8, AP000075.1, AC008651.7, AL133238.3, AL359816.16, AL121694.4, AP000639.4, AC004029.1, AL121757.7, AC002349.1, AC027304.3, AC004397.1, AF003627.2, AC018637.3, AL355615.12, AB038653.1, AC011755.7, AC022468.5, AL133325.20, AL356113.8, AL121986.12, AC004636.1, AL356213.10, AL390023.8, AC008496.5, AC009812.17, AL136374.4, AC007388.3, AC005280.3, AL133404.8, AC012309.7, X14975.1, AL133240.3, AL158069.16, AC011310.3, AL356782.14, AL158055.12, AC010285.4, Z84482.1, AL359950.4, AL034428.4, AC010145.9, AL441887.9, AC003085.1, Z83836.2, AC025420.26, D86996.1, AC007392.3, AC007207.22, AC020717.3, AC022316.18, AP002532.1, AC012323.7, AC026413.5, AL590792.1, AL031387.4, AC022083.6, AL512885.4, AK021525.1, AC005614.1, AC008162.3, AL136170.12, AF248484.1, AL033524.11, AC079175.24, AC007051.3, AF127577.2, AC016396.5, AL132715.3, AL359398.2, AP000626.5, AC073095.3, AL353580.7, AL354758.14, AI251973.1, AL034545.1, AC004551.1,
HCEWE20	85	543370	1 - 871	15 - 885	

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HCFCU88	86	553587	1 - 839	15 - 853	AI916386, AI392712, BG035021, AL135901.23.
HCFMV71	87	526599	1 - 386	15 - 400	BF592932, AI660093, AI917105, BE502245, AI435489, AI168436, BF131228, R69799, R67877, R81389, AW170015, R34017, D51015, AI283968, R69800, F08994, F08984, T16467, R81390, R67878, R33479, AI581033, BF981109, AL110306, AI929108, AI538885, AL046944, AI889189, AW858243, AL039390, BF795712, BG257535, BE963035, BG110517, BG029667, AI433157, BG252929, AI539771, AW162194, AI345688, AI537677, BF811804, AI500659, AI815232, AI801325, AI500523, BF812438, AI500714, AI433976, BE885490, AI923989, AI284517, AI500706, AI445237, AI491776, AW151138, AI521560, AI500662, AI284509, AI866573, AI633493, AA470491, AI434256, AI888661, AI284513, AI888118, AL045626, BF911521, AI671642, AL036403, AW022808, AL041150, AL513577, AI620284, AI582932, AI888665, BF812963,
HCFNN01	88	430297	1 - 1247	15 - 1261	

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HCOOS80	95	1134974	1 - 1240	15 - 1254	AL523700, AL522694, BE613756, AW593997, BE790827, BF526401, BF448973, AW016304, AI400000, BF438433, AW972831, AL522671, AA639399, AW173281, AW665437, AA805253, BG120869, AI125734, AI656792, AW275025, BE614625, AI561207, AI394693, AI095511, AI379330, AI036013, AI374641, AA905729, AA653313, AA807671, AI089517, BE876956, BE963616, AI863503, BG056832, AL523701, R76330, AA325249, AA812964, BF941870, R79509, AA121257, AA527638, AL520580, BF772183, BE378578, R38325, BF515782, BF514354, AA452283, AA779864, R39405, AA121256, BE677848, AA236132, BE395944, AI269580, AL514627, AL513779, AL514089, BF970652, AW192701, AI637584, AL513817, AI478123, BE966479, AW827289, AL513631, AI812107, AI921248, AW104056, AL037081, AI670009, BE965014, AI433157, AI702073, AL514087, BF812961, BE960196, AI590530, BG109270, AL513553, AI633125, BG179993, BE047852, AW148408, AL037104, BF032768, AI582871, AI445025, BG029667, AI874166, AL042745, AW192652, AL514701, BE964495, BG178911, AI610690, AI619502, AI627988, BF856052, AI580190, BG112718, BE540365, AI921464,

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HCUBS50	97	499240	1 - 665	15 - 679	BF691828, BE463583, C06338, A826324, A622862, AI890787, AA775044, BE566444, AA621523, BF207929, BF208992, BE928360, BE568426, AW873470, BF036636, AI632964.
HCUCCK44	98	720291	1 - 851 1 - 1125	15 - 865 15 - 1139	T02949, Z62487. 1. AL532468, BE621866, AL521895, BE621760, BE538472, AL521894, AV734260, AV723629, BE770935, BE790853, AI140351, BE621673, BG168718, BF793790, BE908998, BE545559, BE616433, BE395052, BE621070, BF664130, BE937841, AI859347, AV696398, BG164550, AW977552, BE731169, BE514231, BE312999, BE717043, AV696286, BF726404, BE018100, BE717057, AA121548, AA768342, BF326554, BF430984, AI864674, AA530873, BF338307, BE717061, BE676694, AA127712, AA722381, AI815642, BE281457, BE717055, BF971805, BE795728, AA987515, BE717048, AW275917, AI354682, AI859814, BF686844, BG035461, BF977210, AW474962, AI025466, N92869, AA768339, BE396293, BE301588, AI051671, AW753719, BE965688, AI920875, BE812296, AW089493, BE535563, AW190165, AA417302, AA130959, AA587755, BE717112, AA045598, N21328, AV712375, AA314322, AA844332, AI371694, AW578738, AA100477, AA043186, AI567303, BE717183, R83064, BE891492, BF809525, AI350331, AI039892, AW193146, AA828283, AI952434, BE717068, AI289086, AW377665, AI014387, AA917482, BE560356, AA975893, N21020, AV758595, AV760858, AA621534, H94056, BE218977, BE741064, AA100476, AW406948, AI564973, AA729835, BF594159, AA417265, AI187288, AA045597, AA306867, BE548903, AA661773, BF027132.

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HCUEO60	99	499242	1 - 1208	15 - 1222	<p>AV748967, AV762395, AV761362, AV762397, BG104886, AV760057, BF668217, BF677892, AL046409, AV763971, AI284640, AV761489, AI334443, AI963720, AV728425, BG249643, AV763449, AW303196, AW301350, AV735370, AV725423, AV762111, AW274349, BF541120, AV762098, BF241967, AV763255, AV759274, AV761786, AI270117, AV740801, AV763540, BF337291, AV763670, AV762064, AI138265, BF697673, AW833862, AW023672, AV761843, AI305766, BG167139, AI431303, AW419262, AI133164, AW268973, AW088846, AW193265, AV762505, AI696962, BF131362, BF684828, AW472872, AL138455, BE562953, AW963497, AW965008, AA490183, AI281881, AA581903, AA521323, BF827410, AI610920, AV762092, BF311000, AV760937, AV732891, AV763354, AL042853, AV762535, AW979060, AV759505, AW327868, AL119691, AV762826, AW975987, AI754658, AI038785, AI345654, AW501386, AV762645, AV652936, AV763558, AI613280, AV760777, AV733830, AI064864, BE049139, AV761941, BF680074, AV764307, BF965007, AV702857, AW662543, AV734666, AA491814, AV7729809, AI345681, AI679782, AL046205, AW500125, AV759352, AW265393, AV757425, AF330238, BF725504, AV699574, AV764228, H71429, AW974109, AV764235, BG109996, BF915247, AW503666, AW502975, AV759204, AA491284, AV761106, AW518220, AW972871, AA521399, AV725431, AI307608, BE276880, AV759507, AA610491, AV764578, AI345675, AW975049, AW973397, AV762009, AV761884, BF991286, AV735495, AI570261, AL041690, AA680243, AV762959, AI144101, AV760486, AL045053, AA587604, AI368745, BF679304, AV710066, AV760466, BF793766, AV761745, AW969629, AA526787, AV763633, AF074677, AI732865, AI350211, AI890348, AW953071, BE150380, AW576391, AW513362, AL037683,</p>

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HCUGM86	100	847040	1 - 613	15 - 627	AA722669, AC005035. 1.
HCUHK65	101	651313	1 - 353	15 - 367	AI161343, AL520380, BG1111970, W84487, AA868067, AA931374, AI271350, AI080159, AA970366, AI221950, Z39489, F02802, AA213383, AI205879, N92722, T08346, R42398, AI743040, R37459, C02421, F04701, N92721, AI861833, W84564, BF062378, BG032378, AI190488, AL442092.1, AC004142.1, AB060967. 1.
HCUIM65	102	550208	1 - 861	15 - 875	BE781101, BE540200, AI972511, BE300952, AA464837, BG150212, AI681901, AW172458, AA099207, AW205564, AW408650, AW205714, AA450308, AA636047, AI656442, BF437116, BE466112, AW575656, AW962721, AW206882, AA099221, AI620473, AA369585, AW469939, AW136836, BE547752, AI638262, BF059133, AA236642, BE551958, AW086133, AI917742, AI623315, AC005391.1, AL445584. 16.
HCWEB58	103	1352416	1 - 1269	15 - 1283	AV762098, AV718260, BG249643, BF677892, AI334443, AW965008, AV764228, BF697673, AI270117, AV710066, AI284640, AW072923, AV733830, AV713243, AL046409, BE646496, BF680074, AL138455, AW303196, BF241967, AW301350, AL037683, AL120483, AV760466, AV760599, AA055169, AA490183, AW406447, AV710387, AW769399, AA587604, BF681576, AI133262, AL046205, AI445582, AI281903, AW008212, AV764578, BF725504, AA244357, AI567674, AA521323, BF680041, AA813902, AV763354, AL041690, AV762645, AV763714, AV760042, AF330238, AA521399, AA719292, AV762959, AV759505, AV759204, AV760777, AW274349, AA838140, AA857486, BG167743, AV760937, AI307201, AI538852, AI696962, AA126035, BF676981, BE967369, BG109996, BF337291, AV762139, AL044940, AI963720, AV756693, BF679256, AV761286, AW472872, AV764530, AI672135, AV759172, AA501809, AV725431, AV761925, AW373587, AI076616, AV979060, AV762397, AI654588, AV728425, AW502305, AV760039, AV762050, AI431303, AV763670, AV762064, AV729809, AW518220, BE160727, BF668217, AI064864, BF679274, AA720702, AV763629, AA640772, AA526787,
HCWGU37	104	1042325	1 - 2763	15 - 2777	

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HDHEB60	107	499233	1 - 1407	15 - 1421	

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HDHIA94	108	765171	1 - 1475	15 - 1489	T75217, R21117, F12855, AA825244, T06656, AA393627, AA400803, BF087642, AF169257.2, AL121761.5, AL121830.25.
HDHMA45	109	902513	1 - 2170	15 - 2184	AL538140, A1653241, A1826089, A1967938, AW003801, BE222599, A1056603, A1085672.

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HDHMA72	110	547772	1 - 4449	15 - 4463	AF107454, AU131474, AL527406, AL527364, AU125391, BF969516, AW207619, BE908862, BF968132, BG260993, BE876744, BF439992, BF667287, AW340566, AA534290, BF130397, AA282393, AI635585, BE857014, AW953403, BF132394, AU145369, AA776464, AW139543, AI880884, BE874401, H24404, AI564770, BE618887, AA205320, AA307511, AI697902, AA947281, BF980901, BE972350, AI625227, AI094857, BE890171, AI942231, BF669953, AI767771, BE873512, BF576213, AA443876, BF510801, AI138757, N59387, AI206904, BF060757, BF038635, BE218501, H23497, AI129939, AI359282, BF770081, BF680672, T75075, AW169922, BF680887, AA400655, H18538, AW513886, AW821652, AW438395, AI017751, BF698925, AA307337, BF665081, AW951664, H23505, Z43207, AA309597, BF131428, AA476728, BF001173, BF666559, T77003, AU118919, AI827798, N28440, BF509910, AA485147, AA005130, BE245726, AI991609, F06371, AW751560, AI431939, F06352, AA662978, N77075, AI363369, AI206609, AV722188, BE858247, AI032106, AI363266, AA554317, AI560382, AI261716, BF932190, F13039, BE787193, AI040191, R40397, R80381, AW007847, R80487, T87366, AA024900, H14797, AI301618, AA206751, F07384, R02736, H68321, Z39279, AI023953, AW316878, AI675507, AA953932, W93286, AA970085, Z42220, AI928411, AA037301, F02661, W93287, T89999, F11062, AI587242, Z43926, AI249693, T78880, F02642, W32125, AA024899, T82820, T82305, W46783, R13009, Z45415, AI365308, BE184024, F12724, AA005415, F10631, R02735, W46782, N59001, Z45760, R83449, BF332782, T98853, W31631, N50637, Z39986, R38518, AW363028, AI081008, AA400700, BE618487, AA331899, AA296346, F01749, T99449, AI471180, BF332556, Z41409, H14798, BE790376, AA218742, AW812111, F03625, H18430, R13181, AW753043, AI673745, N54124, AA581647, AA485032, AI382497, BE932794, BF374955, BE161420, AA282051, BF879002, AI214731, N55845, AC005534.2, AK026940.1, AK021727.1, AF063592.1, AF348513.1, AC007075.3, AC007097. 4.
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HDPBA28	113	1062783	1 - 3433	15 - 3447	T27258, AU140225, AI634860, AI767588, BE536545, AV689583, AI991689, AI635347, BE386012, BE767008, AW976840, AI640606, BE178142, BE177971, AW502888, AA977785, AI979247, AW503911, AA971157, AI135446, T27536, AA491080, W74279, R07065, AI687230, T27535, AW816221, AA436906, BE151455, BF510035, BF803181, BE151443, AA152394, AW505067, BG003144, AA761110, AA377229, AV648450, BE671931, AI873792, AA397568, AA399529, AA679080, AI382296, AV648107, AV648212, AV648537, AI913234, AI741350, R50230, AI920850, AI018184, AA702114, AI244588, R81654, AI126673, AA152500, BG057181, AA148355, BE817269, AF222340.1, AF183569.1, AF106037.1, AB011097.1, AC008906.5, AC009073.8.
HDPBQ02	114	1352298	1 - 1152	15 - 1166	BF683980, AL519367, AL523486, AL522136, BE378181, AL530151, BG256964, BE905552, AL525013, BE336792, BF128953, AW955964, BG258633, BE018184, BF530282, BF794689, BF341074, BE548469, R56528, BE386286, BE796521, BG121890, T27113, BE385861, AI751297, BE885463, BE730230, BE737418, BE735551, BG253494, BE548802, BE378174, BF367101, BF219433, AA338058, AI751296, BG104457, BF365262, AA310765, AA586725, AW005522, AI950821, BG026796, AI858224, AL079655, BE218395, AI186587, AI984695, AA256820, AA353016, AA071387, AW806582, AA723380, AA780721, AI333776, AA410975, AW272455, AI570826, AI633718, AI460137, AI083503, AI354691, N64392, AI278481, AA808611, AI858753, AA736383, AI366814, AI032032, AA731626, AI291333, AA971299, AA418840, AI088827, AW026369, AA156128, AI568234, AA486525, AI074868, AA588042, AA814189, AA635110, AI355387, AI560154, AI384079, AA553902, AI123891, AI479017, AI439003, AA278716, AI123393, AA761282, AI718057, AA593316, AA994585, AA478160, AA993638, AI149434, AA994961, AW015199, AA404355, AA488430, AA837073, AA156467, AI568647, AW627783, AA806763, AI567481, AA701486, AI041032, AW070310, AA464385, AA974916, AI203977, AI081515, W37397, AA181845, BE348436, AW248680, AW665822, BE880512, AA147767, BE207736, AW592610, BE545785, BE621619, AI880395, AI709014, AI669418, AW131857, AI634191, BE855860, AW241902, AI625920, AI738622, AW007183, BE621366, AI860983, AW275869, AI670007, AI813518, BF219907, BE795421, BE903106, BE396510, BE294812, BE267959, AI524630, BE514253, BE561350, BE253824, AI954083, BE792677, BF965674, BF313875, AL522366, AL520937, AL520938, BE792140, AL522365, BF310540, BG027674, BE796431, BF314475, BF569123, BE561212, BE746920, BG107642, AA146975, AI277588.

					<p>             AI189954, AI129237, AL524629, AW117176, AI685085, BE350585, AW573314, AW250561, BE906475, AW188410, BF869543, BE390312, BF732893, AA835483, AW182215, BE909654, BF104971, BE966882, AL040274, H38063, AC0104127, BC007653.1, AB016492.1, AB016493.1, AC022274.5, L21174.1, Z17027.1, BC001667.1, AF115850.2, AB016488.1, BC001363.1, BC004239.1, BC000499.1, Z23553.1, AF131797.1, BC000996.2, AL357075.17, AF002992.1, AF222684.1, AL163208.2, AL121874.12, U28692.1, AC004804.1, AC010255.9, AC017006.4, AL139114.12, AF065393.1, AC006032.5, AC025568.25, Z16650.1, Z81364.1, AC011286.7, AC006305.2, Z98886.1, AC025570.43, AL161908.13, AL390239.16, AC013474.10, Z24291.1, AF240629.1, AC008450.5, AB020862.1, AL023754.1, AC073057.6, AL132670.18, AL162377.10, AC040163.3, Z17076.1, AL441963.7, X62922.1, Z84492.2, AL139812.11, AC040172.4, AC002456.1, AC079316.15, AL161630.12, AC005703.2, AP001929.4.           </p>
HDPBQ71	115	1160316	1 - 2298	15 - 2312	<p>             AL517702, AL535136, AL517701, BF966919, AV712906, BF310001, BE785105, BG023779, AW608043, AW959115, AW571652, BE546297, AV733133, BG164317, BF965688, AA910337, AW070547, AA630221, AA936329, AI077660, N66596, AA233825, BF769251, AW169158, BE896148, AW966447, AI092899, AI804163, BF966148, AI184325, AI400074, AW105140, AI038519, BE178803, AI243767, AI803580, AA449258, AI089365, AI969422, AI292304, AA971310, AV753091, AA233729, AI289889, AI335939, AI275621, AV748056, BF828492, AA451735, AA973548, H19041, AW129980, BF791539, AW472838, H65681, AA478196, AA666224, BF940460, AI002830, AI374721, AI264277, H29405, BE930289, AA446666, R52737, N99048, F06358, AA233772, H11875, H65682, BF725919, R64291, R59440, AA812450, Z44951, BF825554, BE711465, F07390, AA093749, AI080343, R24935, R64256, AA878276, BF248328, AA081567, AA081513, R20695, D11945, AA249453, AW630557, AA331924, F07956, AI672272, AA383930, AA385881, R63983, AA865796, AI078076, AW964475, AA448551, BF878091, BF091153, T97552, AA453075, BE937893, N98627, T53666, BF836787, R64175, R63901, AA319203, AA424168, BF791814, BG001790, H11513, BF376043, W30696, BE739183, BF086020, BF376012, AW189731, BF769066, AA383577, AW388471, AW388477, AW810765, AW388507, BF247577, AW810647, AW810736, AA092943, T97598, AW810677, AW627523, AW810964, AI261898, BF216270, BF855391, AW810687, AI221448, AI147974, AI611624, AA730133, AI377784, AI672529, BE551587, AI936568, BF115500, BE466653, AW303619, AW388498, BF382656, BF751597, AI962331, AW006254, AI351767, AI655026, AA884783, AL119457, AL119324, AL134524, AW971745, BE161864, AW149892, AL119396, AL119443, AW804686, AW392670, AK027596.1, BC006321.1, AF212247.1, AB062962.1, AC007533.2, AB026436.1.           </p>
HDP0025	116	460682	1 - 753	15 - 767	AI193249, AI809829.
HDP0037	117	837699	1 - 1918	15 - 1932	<p>             AL520370, AL529690, AL524481, AL520369, BE274454, AU141822, AU132723, BF314732, BE273689, BF026599, BE736766, BE791870, AI191318, BF689450, BE894541, BF690012.           </p>

					BF344946, BE880507, BG118146, BE410790, BE620315, BF969947, BE908116, BF183246, AW239293, BE260297, BF983977, BG121624, BE293262, BE907076, BE620852, BF868566, AI978812, BE049271, AA586860, BE272490, BF034205, AW474556, BE293363, AA805184, AI628509, AI582366, W73797, BG118530, W73745, AW083832, AI620297, BF434062, BE293362, AW967627, BG120472, AW628388, BF690389, AW513995, AI056600, AU154200, AW386876, BG160073, AI056739, BG253585, AI362766, AI494212, AI077551, AV111723, BF689649, AA935678, AI348675, AI358232, AA251769, AA968828, BE788883, BG252031, BF846596, AA659758, AI891139, BE964553, C06060, R67182, AA746268, AA506524, AA251926, AV736190, D81244, AA291462, H58621, AV739502, H58622, BF690549, BF183479, R38144, AI919497, AW193598, AI250032, AV740386, AA604444, BF359113, AI567397, AA905208, BF880393, BF745974, AA836253, R57498, AI525934, BG107079, AW663025, AW754473, BE718998, AA551675, AI364618, AI421662, BE938093, AW166086, R59996, AW151132, AI469754, AI554821, AL042593, AI654286, AL513693, AL513991, AI366900, AL515171, AW858522, AW151974, AW058275, BF970652, AL043152, AL513823, AI815239, AL513569, AV681993, AI538850, AL513713, AI801286, AL514919, BF033177, AL513729, BF304021, AI271716, AI815233, BG167830, AI440260, AI537677, AI494201, BF812963, AI804505, AI500659, AL513901, BE883591, AI866465, AI815232, AI801325, AI866691, AI500523, AI887775, AI582932, AI590043, AI923989, AI284517, AI872423, AI500706, AI491776, AI445237, AI289791, AI926593, AW151138, BF811804, AI889189, AI521560, AI285417, AI500662, AI623302, AI924051, AI539800, AI582912, AI284509, AW172723, AI538885, AI889168, AI440263, AI927233, AI866573, AI633493, AI434256, AI866469, AI434242, AI805769, AI888661, AI889191, AI500714, AI284513, AL514043, AI888118, AI285439, AI859991, AI436429, AI355779, AI623736, AI889147, AI581033, AI371228, AW194509, AI491710, BC001371.1, AK023931.1, AK001645.1, AY007088.1, AL135844.9, AF086313.1, AL356652.19, AL162002.1, AF155656.1, AF326206.1, AF265236.1, AL022315.1, AF084644.1, AF084645.1, AF159615.1, AL133084.1, AL133655.1, AL136805.1, AL133076.1, BC009395.1, AL136763.1, AL133047.1, AL133051.1, AL137561.1, AL133070.1, AL049423.1, AL136765.1, AL136781.1, AL122101.1, BC000234.1, AK025113.1, AL133053.1, AL136825.1, AL133049.1, AL133608.1, AL133607.1, AL117590.1, AL389983.1, AL133015.1, BC006091.1, AK000074.1, BC008075.1, AL133062.1, BC002396.1, AC007511.8, AF029750.1, AF002985.1, AK027096.1, BC006832.1, U73682.1, BC004416.1, BC002914.1, AL136849.1, BC001670.1.
HDPFF39	118	588697	1 - 1242	15 - 1256	AL526869, AL523945, BE794829, AI532486, AL533032, BF969304, BG115956, AL514521, AI871493, BG028151, BF689553, AL531509, BF689896, AA005246, AW392303, AI921136, BE620088, AI921426, AL514522, AI800003, AI571833, AI097128, W68743, AA587786, AI928547, AI588884, AI366187, AI469283, BG059843, AI091266, W68721, AA731294, AI023709, BE218286, AI571471, AI628000, AI819634, BE207917, AI247849, AI085331, AW274586, AI752152,

					AI866693, BE382434, AW264556, AI570330, AA909236, AW602670, BF091955, AI185842, AI627586, AI189900, AI417779, BF822519, BE673374, T81959, AI623337, AI970967, R86832, BE940065, AA074519, BF944761, AW364990, AA865886, AA722301, AI539598, BF095254, AI494220, AA327238, BF345347, H82580, AI571973, AW516484, T81955, AW439461, R56100, W27475, AW470712, BE743030, AW674734, AI953321, AA076557, AA731651, BF056789, AI134661, AW131498, AW772519, AI609719, BF855458, AW073075, AW365079, BF808730, BF526571, R60226, AI918145, T57354, BG253820, BE886275, BF799596, BE938387, AW517642, AW886746, BF951584, BF684157, AW204188, AI032686, BE936805, BE843795, BE933378, AI523946, BF999019, BF980469, AI589371, BG120896, H16171, BE937970, AW938898, T57436, AW882041, BG121424, BF851425, AL532487, BG163558, BF762612, AW138659, AI364407, AW513032, BG105148, AA005140, AI097132, AA767618, AI572822, R86655, BE962190, BF947166, Z43259, BF690126, BG115718, AW663033, AI932620, AI559976, BE620628, AI358271, BG167830, AI924051, AW858522, BF812963, AI804505, AI500659, AI815239, BE883591, AI866465, AI446536, AI815232, AI801325, AI866691, AI500523, AI538850, AI887775, AI582932, AI872423, AI590043, AI923989, AI284517, AI500706, AI491776, AI445237, AI926593, BF811804, AI289791, AW151138, AI889189, AI521560, AW151974, AI500662, AI285417, AI623302, AI539800, AI284509, AW172723, AI582912, AI538885, AI440263, AI889168, AI927233, AI866573, AW058275, AI567961, AI633493, AI434256, AI866469, AI434242, AI805769, AI888661, AF037339.1, AK027698.1, AF037338.1, AC011489.6, BC004865.1, AL133655.1, AL133074.1, AL136763.1, AL133076. 1. AW976171, BG258661, AA427627, AA811193, AI275905, H20137, AI384044, AI339568, AI739227, AI923644, AI970737, H39189, H45408, AW130634, BF059008, AI659951, AI739226, AI142039, AI394459, AA968938, AI269770, AI392978, AA969916, AI364323, AI378436, AW137018, H46909, AW615186, AI356177, BE747385, BE898748, AA714852, AI934509, BF763404, AV745344, AI000835, BF877861, AK025886. 1. AI382347, BE672925, AA328438, AI933550, AV658526, AV659132, FI7041, AI378966, AW881484, AU159276, AI457143, BF435633, AL118834, AA299156, AW468555, AI926394, BF727445, BF689260, AI610326, F18611, BF878671, N26697, BF438919, R92170, AA069204, T78609, T62932, AV685376, AI928570, BF850110, T78394, AV718691, AV719171, AI220812, AI193408, AV720907, R84298, AV718419, AI309322, AA826143, FI7026, AA724610, AI862212, AI439415, AI890953, H01156, AA347740, AA565837, H49709, AA811111, AL043725, AI147839, FI6584, AA904946, AI054162, AA771958, AI570164, BF112065, AA132716, AW604787, BF679645, T06365, AI591332, AL137072.8, AC025097.41, AC016689.3, AC026951.5, AP003117.2, AF274857.1, AL096705.12, AL137881.12, AP001960.2, AP003534.1, AL049564.10, AC023134.5, AL109659.20, AC012450.9, AL133247.1, AL139093.11, AC079906.15, AL513163.8, AC015729.9, AC083865.2, AP001880.4, AC009501.3, AL390027.11, AL359545.12, AC016568.4, AC006313.1, AF250841.1, AP000810.5,
HDPGK25	119	704067	1 - 689	15 - 703	
HDPGP94	120	823355	1 - 3867	15 - 3881	



				AL160052.21, AC010980.8, AP001858.4, AC020717.3, AL139395.6, AP001831.4, AL109759.4, AL158069.16, AC004010.1, AL050309.4, AC002381.1, AC090497.2, Z84720.1, AC017089.3, AL136136.7, AC003051.1, AL049835.3, AC007436.1, AC004384.1, AL158150.14, AC006362.2, AC008817.7, AC008582.6, AL356317.8, AE000661.1, AC007486.1, AL160236.4, AL132800.4, AL358274.3, AL590043.7, Z68871.1, AC025254.14, AP001712.1, Z93019.1, AC004855.1, AP002532.1, AL360157.12, AC008664.5, AC007253.2, AF003529.1, AC018927.6, AL445523.11, AC022443.4, AC004385.1, AC009483.3, AL359400.4, AC009779.18, AC016579.5, AL390039.10, AF280107.1, AC008550.4, AC023426.29, Z84474.1, AL080312.14, AL121788.17, AC021998.4, AC073574.11, AC012669.7, AC005342.1, AL356016.2, AL356265.10, Z84470.1, AC006395.1, AC005018.2, AL445528.16, Z78022.1, AL158819.14, AC026337.29, AL359636.17, AL353897.7, AL365475.1, AL360297.12, AP002026.1, AC090710.16, AL139277.7, AC002429.1, AL355530.6, AC010223.5, AL450338.5, AF128525.2, AL590306.7, AL359925.9, AC026201.3, AL049646.19, AF011889.1, AC006596.2, AC020637.9, AL390035.10, AL159980.13, AC018644.6, AL512641.9, AL358434.16, AL133329.11, AL133399.1, AL356019.5, AL445306.7, AC015798.7, AC005016.1, AC084754.14, AF250324.1, AL357115.24, AL355375.17, AC016617.5, AC022116.5, AC009623.6, AL359232.4, AL135923.15, AL022400.8, AL360270.18, AC078848.3, AL353136.21, AC016743.10, AC022268.5, AL163218.2, AP001669.1, AL355888.3, AL121933.15, Z94056.1, AC008912.4, AC019060.5, AC078854.16, AC000059.1, AP002364.3, AC026756.15, AC023892.35, AC069114.4, AC073218.5, AC004917.2, Z97198.1, Z95328.1, AL096867.15, AL133233.2, AL353744.18, AL136520.3, AL590031.6, Z82216.1, AC004945.1, AP003351.2, AC008558.7, AC073964.3, AC003082.1, AC006427.13, AL034396.6, AC022008.3, AC009487.3, AL445495.5, AL357312.8, AC021878.4, AL441927.10, AC009812.17, AJ271735.1, AF235098.1, AL358293.4, AC004053.1, AL160413.7, AL392087.7, AC023795.18, AC009484.3, AP000457.3, AP000484.5, AC012082.6, AF205588.1, AF297093.1, AC006372.2, AC024581.3, AC009514.2, AC025272.6, AL135960.1, Z99572.1, AC083860.2, AL360179.8, AC010884.10, AP002533.1, AC010255.9, AL136109.11, AL021307.1, AC026398.4, AL391379.12, AL355146.13, AC083875.1, AC022212.4, AC008782.6, AL138815.6, AL049641.10, AC016752.2, AC012076.4, AL080239.11, AC015631.10, AF198097.1, AL136090.12, AL022577.1, AL157698.8, AL499582.13, AC005166.1, AC004756.1, AC005060.3, AC008008.2, AC006210.2, AC020896.5, AL031114.1, AL139109.14, AL022151.1, AL391422.16, AL031176.8, AP001331.1, AC005946.1, AC018755.3.	
HDPH151	121	460679	1 - 714	15 - 728	
HDPJF37	122	704487	1 - 972	15 - 986	BE262780, BF317450, BF313101, BF207173, AW195799, BE857989, AA311391, AW205695, AI160666, AW262228, AW052051, AA367991, R74203, BF901238, AW026920, R74295,

HDPJM30	123	879325	1 - 1621	15 - 1635	BF880147, AA644389, BE795190, AI934065, BF530635, BF896366, D20643, BC004895. 1, AI420713, BF951818, R85260, H28149, BF899899, BF594396, AW292642, H44846, BF685411, AI739196, AI867313, BF063759, AI380559, BE504664, AW166357, BE735346, BF064117, AB001535.1, AP001754.1, AP001065.1, AP001064. 1.
HDPNC61	124	637585	1 - 1396	15 - 1410	AA847865, AA483400, AI016714, AI051725, N62194, BE047259, BE327006, AA483411, AI554330, AW874660, AA933624, N66755, AI825794, AW327616, AA902896, AA725234, AI769182, BF448730, AA054669, R60056, AA594900, H05474, T16298, AA977118, AI671131, AA054722, AA650410, BE719696, BE719698, R43427, AA716570, T82929, AW327262, BE044255, AA761969, AW974625, AA916000, T34734, BF817206, AA805766, T90105, AI249880, AA342241, AA811545, AW956711, AA484223, AL354808.24, AC003098.1, AC079602.15, AL049569.13, AC004166.12, AL450325.5, AC005288.1, AC005736.1, AL157838.24, AC027644.9, AP000350.1, AC011475.6, AL022238.1, AC005098.2, AL096791.12, AC006261.1, AL022476.2, AC090944.1, AC008569.6, AC007899.3, AL590763.1, AC020917.4, AC087071.2, AL359397.3, AL135752.6, AC013726.7, Z85986.1, AL354815.10, Z93015.9, AF053356.1, AC002302.1, AC005488.2, AF064861.1, Z83826.12, AL357515.26, AC016637.6, AP001748.1, AL445645.10, AL499628.1, AC020931.5, AC004826.3, AL359091.10, AC004965.2, AL353653.19, AP002852.3, AC020750.3, AC004867.5, AC006001.2, AP001705.1, AC005995.3, AC010150.3, AL139289.6, AL031005.1, AL355392.7, AC005077.5, AC006966.3, AC005056.2, AL135901.23, AC009144.5, AP001727.1, AL163279.2, AC009753.5, AC004699.1, Z84466.1, AL157938.22, AC083884.6, AL050341.18, AL355543.13, AC004820.2, U95090.1, AC005844.7, AL353804.22, AL163032.3, AP002812.3, AC005052.2, AL049776.3, AC006117.1, AC007220.4, U95740. 1.
HDPND46	125	637586	1 - 1713	15 - 1727	BG058578, D20888, AL034424. 9.
HDPOE32	126	897276	1 - 1339	15 - 1353	N43024, AA284735, N30921, N33362, AA736727, AA477254, W31624, AL533888, AI350205, AA306490, AL520318, W32089, BE395042, W42796, BE251326, AI951749, AA464683, AI694661, AA298928, AI571803, BE257270, AI021931, AI871631, AL530622, AA071502, C14760, AA622514, AI143235, BE005514, BF216867, AA297690, BE005513, AI023746, AI498301, AW028350, AA477253, BE045131, BF927531, AW024940, AI240266, AI493740, AW295451, AI418206, AI418223, AW779350, BG055383, AI245358, AI911036, AA759227, AA602479, BF215223, AW294426, W89051, AI343854, T62095, AV736738, AI767945, AA977564, AB026899.1, AP000500.1, AC011811.42, AC012507.9, AC006365.3, AC004847.3, AL034376.10, AC005094.1, AL079304.3, AL121857.5, AL355074.5, AC020983.7, AL031407.3, AP002028.1, AL157382.14, AC012512.7, AF063605.1, AL034396.6, BC000642.1, AL163194.5, AC019041.8, AL138720.19, AL356257.14, AC084881.19, AL136374.4, AC008009.4, AL353616.13, AF001548.1, AC078994.3, AL163639.3, AC022002.4, Z84474.1, AP000810.5, AC026421.3, AL162378.16, AL353748.13,

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HDPOH06	127	683371	1 - 2490	15 - 2504	BE790341, BG105222, AV707856, AW955948, AL378660, AA669141, BF725031, AU154522, AI985796, AA688220, AI042515, AI372881, AI014423, AW025175, AI335099, AW263024, AI491990, AW128917, AL570270, AI128127, R91019, W85883, AW474941, N59550, AW305279, BF931700, AA679558, AV653236, AI635705, AI559984, F00878, AW340645, R08677, W85967, AI262108, T98198, AA670170, T53837, BF926938, BE937947, AA337112, AA583164, AW888374, R88760, BF091472, AA902605, BF935752, N78291, BE766705, T98199, AI540509, AK001709.1, AC018648.5, AC003108.1, AC003684.1, Z95152.1, AC010530.7, AC008760.6, AC073101.7, AF334404.1, AC004694.1, AC074121.16, AL391122.9, AC011445.6, AL354815.10, AC010618.7, AC002365.1, AF243527.1, R08585.
HDPOZ56	128	1352319	1 - 1891	15 - 1905	AI859620, AI830021, AI949469, AI887204, AI218392, AW194364, AW511272, AI307671, AA970014, AW582666, AW609988, AI873619, AC011452.6.
HDPPA04	129	904765	1 - 2392	15 - 2406	AU135908, AI990290, AW961323, AI798762, AA044757, AW105205, AW197379, AU156359, AA039608, AA247117, AW889458, AA303575, AA036918, AA247128, AI214428, AW449368, AA044631, AI762460, AL162253.17, AK001872.1, AF344424.1, AF329193.1.
HDPPH47	130	630030	1 - 2066	15 - 2080	AU136625, BE173585, AW971689, AV758108, AL532612, BF691477, BF208141, BE173409, BF526250, AU139755, BE173471, BF576897, AU138444, BE173481, AI766639, BE173586, BF102702, AW361626, AA446322, BF218355, AI147871, AI423223, AA446503, AA326713, AU157616, BF695259, BE349039, AA043190, AW074400, AU156799, AA641529, AA256744, AA459236, W31760, AI159832, AI419387, BF531085, AA043189, AI031904, BF951257, AI934352, AA627345, BF939730, AA854750, BE866130, AI619780, AI719353, AI886950, AI097237, AI371803, N62242, BF446754, BE173590, AA022728, AW103783, AI082158, BF677334, AA528304, BE895637, AA022820, AI027157, AI033762, AA046581, AI205854, AA459012, AI215871, AI932664, AA846562, AI719873, BF966191, AV734597, BF352288, AA781300, AV659955, N57339, N32245, C20624, AA838762, AW452739, BF966850, BF966206, BF241889, AW813810, AA046667, BE150505, AA830510, AI571690, AI805379, H88240, BG152848, R19454, AI241774, AA349280, AA825596, AW753423, BE502920.

HDPSB18	131	1043263	1 - 3394	15 - 3408	AA385915, H92698, AA721753, AA369579, A1566027, AW771347, BF941206, AW827132, AA369411, R44703, AW591353, AW193628, T61007, A167862, AA376823, BF363932, AW901820, BF363979, A1267646, AA127618, BF363985, R44702, A1699714, BE701927, BF800094, BE242785, BE176885, W04679, H88016, N54489, BE468183, AK002102.1, AF113224.1, AF211480.1, AC021019.5, AL358133.1, AL583831.6, AA631915, AA595661, A1348780, AA489390, AA640305, BG231195, AW239465, A1523205, AA180056, AW975434, A1819419, AV759517, AA199578, BE677227, BF740656, AW839858, A1754064, BF880881, A1270280, A1567676, AA568303, AV706458, BE062357, A1753131, AW247955, A1610814, AA493546, A1086603, AV717475, BF875339, AL355512.22, AF207550.1, AF038458.1, AL109797.18, AL118520.26, AL590762.1, AC003101.1, AC004000.1, Z93023.1, AL121712.27, AL034549.19, AC072052.6, AL117692.5, AC020931.5, AP002852.3, AB023048.1, Z93928.1, AC005081.3, AF196779.1, AL133448.4, AP000116.1, AL121886.22, AP001726.1, AC011461.4, AC005015.2, AC006013.3, AC011475.6, AP003352.2, AL121992.24, AC011491.5, AC020663.1, AC008569.6, AC022087.8, AC011495.6, AC010271.6, AC007546.5, AC004812.1, AL139100.9, AC008745.6, AC079316.15, AC003043.1, AC003962.1, AL035072.16, AC010605.4, AC004522.1, AC007151.2, AL158830.17, AP001694.1, AC009220.10, AC009144.5, AL121574.19, Z98941.1, AL162426.20, AL356299.16, AL122035.6, AL009181.1, AL049569.13, AC074121.16, AL138976.5, AL034372.33, L78833.1, AL117336.22, AP001710.1, AC005913.2, AC006948.4, AC011446.6, AC016894.7, AP001725.1, AC002300.1, AF111167.2, AC005522.2, AC005488.2, AL137229.4, AC008891.7, AC008481.7, AC002470.17, AC011442.5, AC025165.27, AC005004.3, AC005067.2, AL391827.18, AC005377.2, AC003412.6, AP000501.1, Z93244.1, AL158040.13, AL445483.13, AC004967.3, AC006014.2, AL117258.4, AC008440.8, AC011811.42, AL139809.16, AC011497.6, Z97054.1, AL133367.4, AL022316.2, AC018809.4, AL132780.5, AP000692.1, AP000555.1, AC004150.8, AC010553.6, Z99716.4, AC005839.1, AP000892.4, AC009412.6, AP000744.4, AC005180.2, AL135978.4, AP000065.1, AC005098.2, AC004963.2, AC021016.4, AC024561.4, AL139396.17, AC018636.4, AC010543.8, Z93015.9, AL139415.10, AL138756.23, AC024952.4, AC010319.7, AC008806.4, AC010422.7, AL365444.11, AC008812.7, U80017.1, AL121891.22, AC000360.35, AL109743.4, AL096791.12, AL035086.12, AL132712.4, AC010463.6, AP000048.1, AL122001.32, AC004771.1, AC004019.20, AL135927.14, AC007227.3, AC027126.4, AC022384.4, AL024498.12, AC011465.4, AC004890.2, AL132768.15, AL049538.9, AC018751.30, AC007957.36, AC004821.3, AC010458.5, AL109825.23, AC040160.4, AC004125.1, AL109923.29, AC004526.1, AL161937.13, AC006330.5, AL033519.42, AC010598.6, AC008264.10, AC009137.6, AJ003147.1, AL008582.11, AL121601.13, AP001610.1, AL022721.1, AF217796.1, AL049795.20, AB000565.1,
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HDPSP01	132	1352280	1 - 2329	15 - 2343	BE876951, BF791762, BF112057, BG179551, AV752013, AI091429, BF001176, AV752703, BE391989, AI871101, AI458302, AW292744, BF196320, BE391322, BE390919, BF058297, BF435913, AI560217, AI808718, AI658996, BG056475, AI199318, AI381895, AI814608, AW190726, AA047000, AI479404, AI660983, BE388064, AA419038, AA035467, AW517227, AI361637, AI863893, AI198435, AI078128, AI093316, AI403129, AA442664, AA725194, AI831358, BE206128, AI274339, AW297826, AW104389, AI948638, AI261248, AI869935, AA915909, AI283200, AI871060, AI269385, AI769275, AI200508, AI566171, AI275083, AI857306, AA910327, AA046943, AI291474, AI291805, AI983969, AW070742, AA423792, AW339900, AI308118, AI869944, AA012994, AI677732, AI913920, AA661657, AA427407, AI197804, AI141350, AA725186, AA954707, BF111675, AI864014, AI051823, AA864187, W24931, N41835, AA031475, N92812, BF734297, BF733728, AA035466, BF000025, AI026152, AA514348, R70380, AA961077, AA031617, AI673156, AA250784, AA378564, AW051192, AW452102, AA411122, AA886656, AW293787, AA012993, H91665, AA927216, AW149476, H91759, T86488, BC006411.1, AC022007.3, AC018809.4, X87479.1, Z22384.1, Z22374.1.
HDPSP54	133	744440	1 - 3077	15 - 3091	BG256849, BG261011, BG178729, BG110345, AI923220, BE466885, BF667257, AW271504, AW243442, BE466659, BG171469, AV661528, AW271637, AW516811, N36059, AI804888, BE882420, AI650826, BF815232, AW964507, AI921747, BE936373, BF984751, BG259707, AI392784, AW076096, AI807747, AW103424, AA604757, AA633209, AW778887, AW418987, AW242326, BE622192, BF666519, BF978796, AW014203, AI925261, BF853590, AW131363, AW514756, N33223, AI819108, AI126250, AV649748, AI953896, AV714556, AI524472, BF697124, BE218100, AW629098, N21567, AI694687, AI700209, AA731730, AA577191, BE219931, N33824, BE567212, AW778908, AW087660, AI990562, BF792681, RS2426, AI559108, AA743389, N35579, N25189, N30972, BF667662, AI339587, N24947, AI376459, AA742979, N27426, R23308, AI125720, AA954281, AI801129, AW087669, AI701246, AI245517, T26975, BF572334, BE177998, BE564497, AI636147, AI640713, N41938, H97662, AI243263, BE967025, AI572028, BE543895, H29641, BE762905, BF246305, Z46022, H29640, BG223352, AI270534, AI983198, H99399, BF965116, BF692452, Z42169, AI521060, BF102948, R82562, AV646807, N34709, AV646406, R23233, AA373475, BE005657, AA319637, T34245, BG104469, W20047, AW962829, BF572695, AI369988, AI741908, BE830524, H29549, D78710, Z41637, H29548, AA833897, AI367191, AA659275, AW899997, F01708, BF697465, AI246035, AI219239, BF154447, AI221561, AI273738, AI281168, BE005723, BE170424, AI685342, BE882847,

HDPSTU13 HDPSTU15	134 135	638932 692917	1 - 1204 1 - 1382	15 - 1218 15 - 1396	AB007962. 1.
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HDPTK41	136	744824	1 - 1550	15 - 1564	BF982785, AI815076, AW166997, AL079767, AW151042, BF823103, W63598, BF878473, AA449913, AA976313, AW798524, AA479330, AA846290, BF898435, AA836589, AA630200, AI341675, AI434208, AA157695, AI184716, AI361509, AI216438, AI924429, AI244502, T87329, N26990, BF883126, AI694074, AA157771, AI682580, AA304298, BF883106, AW848681, T87430, AW376555, AW376601, AW376609, AW848666, T64266, AA127194, AA308797, AA854135, T70082, AA974005, T98394, T70152, AL219259, AA304365, AW291861, BF883705, R82980, AA400789, AA449914, AI424501, T98393, AW376580, N40111, BF900907, AI301920, AA42329, AW300876, BE512905, BE902037, BE273884, BE901865, BE166105, R82979, BE311462, BE903644, BE901108, AI284060, BG171620, AL515147, BF811804, AI889208, BE875380, AI628325, BF792951, AI682915, BE906273, AI434233, AI436446, AI362391, BF815930, AI561147, Y18474.2, AJ130718.1, AB011263.1, AK025377.1, AF092032.1, BC003062.1, AB020532.1, AL365451.1, AL365452.1, AL365450.1, AL133448.4, AB031537.1, AB031536.1, AB031535.1, AB031531.1, AB031530.1, AB031532.1, AB031533.1, AB031534.1, BC008649.1, AF033827.1, AL133020.1, BC007571.1, AL133074.1, AL136850.1, AL050366.1.
HDPUG50	137	684120	1 - 1720	15 - 1734	AL515943, AL520278, AL531137, AL515942, AL520279, AL217895, AW960744, BF970078, BF001249, BF036496, BE395420, AI983150, BE277851, AW385698, BF979048, BF688139, BE395502, AW374106, AI660124, BF541042, BF210794, BF036241, BE567389, BE778929, BF209890, BF103631, AI339010, AW374124, AA166971, BE564629, BE971080, BE276625, BF509403, AA542906, AA689356, BF695952, AI285269, AI346870, BF541205, BF030313, N27706, BF243030, AW236815, BE567683, AI821227, AI821074, BE566782, AL134542, AA166818, BF570861, BF059406, AA836112, BF695731, D20721, BF130491, BF677074, BG118818, AI221030, AA627350, AW027663, BF106059, N35710, BF674060, BF029128, BE933681, BE933586, AI221246, AW372396, AI285231, T95430, AW372395, AI699709,

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HDPUH26	138	866433	1 - 2902	15 - 2916	<p>AL525441, AL525265, AL528202, AW964372, BE747248, BE743063, BF793839, BE005995, BE870109, AV706482, BE645327, AV698161, BE272135, BE254341, AV704424, AV706294, AA772122, BG153419, AA777796, BE645332, AI743322, AV707082, AV706285, BF382272, BF514943, BE018051, BE673957, BE301907, BF114727, AW964371, BF530465, AA897780, AI890748, AI559637, AI688995, AW780354, BE206397, AW137052, N51699, AW103016, BF794314, AA528004, AW662431, AW085759, BF313538, AI765664, AI954974, AI570150, N20494, R87549, F31312, AI245467, AI991886, AA112198, BG170315, BG178458, AW273510, AI435207, AA004881, AW964399, AA005087, N25526, AW608346, F36783, AA587960, AI815015, AA454482, AW662721, AA318288, AW993077, N29111, AI247285, AA911896, AI766414, R91507, AI279757, BF313030, AW242248, AA707000, AI367676, AW139115, T16478, AW504841, W90115, R12114, T32805, AI675726, AA346284, BF765331, AW993187, AA317950, BE169534, BF692514, AW086086, AA186891, BF749263, BG013421, BF765334, R36868, AW769864, AW884956, AI972497, BE170268, C01229, AA348258, AI953592, F27014, AA599852, AI914300, N51791, BF676529, AI868860, T48372, AI824747, F30177, AI810802, AI263284, AW611772, AA188514, AA603987, T32655, AL528203, AI625886, BF874301, AI346660, AA903746, F35605, AW820935, AW577918, AK000303. 1.</p>
HDPUW68	139	812737	1 - 1734	15 - 1748	<p>AW295848, AI132995, T48851, AI247571, AW469884, AV734061, T48852, BE378325, AW571432, AA344713, AW131386, AU138048, AW190967, BF896891, AA400508, AA400618, AA835515, AF170485.1, AJ007395.1, AJ130710.1, AF193441.1, AJ130711.1, AF227924.1, AB026265.1, AF247180.1, AF178981.1, AF223403.1, AF195092.1, AC020914.7, AF277806.1, AC011473.4, AF135027.1, AF310234.1, AF287892.1, AC008750.7, AJ130712.1, AJ130713.1, D86359.1, D86358.1, U71382. 1.</p>



HDPVH60	140	796865	1 - 3102	15 - 3116	AA503239, AA005023, BG058640, BF439950, AA494553, AI688402, AI797733, AI436404, AA292931, AW273747, BE675352, AI475570, AA227825, AW062928, AI940630, AI940605, BF356100, AI244665, AI940646, AW374287, AI940639, AI016022, AI348158, AW374286, AI475793, AI222804, AA740395, AI289241, AA731769, AW374280, AA293061, AW176407, AI940666, AI952797, AI863905, AW751215, BE074921, AA347230, AW751228, AI253625, AA722775, BE074923, BF091018, AI940657, AA830985, BE246530, AA005022, BE245464, AW194142, BE245946, AW845618, AA679298, AA553743, AW845617, AI986465, AI656229, AI587517, AW845579, AI439199, AI439202, AA905818, AA227999, BF365504, AA347231, AA300784, BF365509, AW062885, AI048537, T61473, AW885247, BG057915, BE247510, AW516362, BF756544, AI762964, AA563914, AI469789, AA903221, BG112718, BG112102, AW411397, AK027414.1, AK027416.1, AK025212.1, AK025362. 1.
HDPWN93	141	992925	1 - 2665	15 - 2679	AL518824, AL518825, AL528951, AL528952, BF339524, BE546359, BF966792, BE736522, BE737435, BE883235, BG109398, BE314676, BE787143, AL534022, BF446115, BE894833, BE870112, BE881800, BE258349, BG250236, BF196311, BE894832, AW769380, BE262368, BE882948, BE259378, BG251409, AA432202, AI890824, AI753494, AI651671, AA993211, BE246045, AW001898, AL039524, AI800905, AI246773, AI682295, AI658613, BE273831, AI631136, AW189302, AI372827, AI050708, AA531521, AI346388, AI683842, AW296359, AW372955, AI685246, AI589722, AW271749, AW804759, BE548044, AA622365, AI352313, BF906035, BE163138, AI088281, AI372826, BF109450, AI015389, AI539826, AA349564, AA48189, AI760986, BE882927, BE247210, HI5544, HI5545, AA349563, BF924519, BE245469, AW804423, H09846, AI991731, AA320029, AA383782, BF804839, HI5604, W67789, HI5603, AI015277, R33930, BF869179, AA543091, AI469944, R48594, BE301391, H09761, AA830547, AA505499, BF809086, AA320560, BE273649, AA326027, R79459, AA322654, L32015, C20992, AI828309, AW117647, BF000032, AW190887, BF736822, AW262975, AA317254, AA143736, BF381075, AW103622, AW050451, AI609346, BE720302, N21451, AI905534, AA282625, AW007401, AA284991, AA621245, BF841809, BE146295, AA143707, AI811818, BF326108, AA393671, BE242665, BF746024, AI678229, BF799280, AA429592, AW407359, BE075823, AK025000.1, AK025622.1, AC004590.1, AF086245.1, AP001434.1, AP000161.1, AP000020.2, AP001731.1, AL137367.1, AC004590, AC021491, AC021491.
HDQHD03	142	1309175	1 - 1252	15 - 1266	AA769067, AA907349, BE676751, AA804234, AA906120, AA830952, AA743729, AA835876, BF434668, BF838119, BE837591, BE837571, BE827732, AA318133, BF807079.
HDTBP04	143	1307742	1 - 947	15 - 961	
HDTEK44	144	1025421	1 - 2056	15 - 2070	AW263031, BF939317, AU158582, BE326883, AI825947, AI674408, AI949058, AI686114, AW236450, AI131456, AI921750, BE646223, AI499386, BF241709, AI744116, HI7702, AA968971, BF197318, AI202380, AI612728, AW151821, AA612626, BG010826, AI568798, AI678940, AI868979, BF748934, AW084407, BE075305, AK023814.1, AC022100, AC022100.
HDTEN81	145	571078	1 - 552	15 - 566	AI718421, AI431290, AI332560, AI391465, AI638172, AA507382, AI734920, AA719940, N70479,

				AI253742, BG059093, AI708198, AI510752, AI637680, AA505271, AI719838, AI707589, AA614722, AI862746, AI830189, AW269501, BE041192, AI471305, AW512571, AW518210, AI708443, AI749344, BG236645, BG059064, AW268642, AI468901, BG059125, BG231197, BG151405, AW877209, AL119457, Z99396, AL119324, AW973213, AW975037, AW973219, AW975954, AW969816, AW975027, BF868697, AW972845, AW861944, AW975002, AW971975, AW974998, AW804686, AW975154, BE705905, AW973230, AW979127, AL119399, AW969680, BF868687, AW969885, AW975692, AW392670, AW979098, AW972292, AW604723, AW975965, AW974801, AW975876, AW979106, AW976031, AW976024, AW975632, AW975032, AW975971, BG153750, AW975966, AW975019, AW975930, AW979090, AW975105, AW975981, BG151745, AW969673, AW975244, AW971403, AW975942, AW973750, AW974786, AL119497, AW979002, AW976511, AW979212, AW979294, AW975628, AW979176, AW971326, BE695785, AW975031, AW971968, AW975941, BF868684, AW973717, AW972377, AW976982, AW974658, AW858526, AW975952, AL119443, AW974964, AW979238, AW976023, AW970969, AW858525, AW974823, AW979204, AW971404, AW973209, AW969839, AW975028, AW969643, AW975015, AW969852, AW971732, AW972296, AW979220, AW979219, AW970942, AW384394, AW975990, AW861889, AW979054, AW975020, AW577135, AW372827, AW972880, AW858455, AW974806, AW975434, AW970868, AW972680, AW974785, AW969791, AW969740, AW974802, AW975025, AW971375, AW979173, AW979169, AW974101, AW974338, AW969637, AW974975, BE705903, AW973819, AW363220, BE705906, AW972817, AW969861, AW976000, AW971378, AW975585, AW972154, AW970936, U46341, AW973785, AW973793, AW975963, AW970889, AW975143, AW975230, AW972825, AW973380, AW975074, AW970954, AW973106, AW979134, AW973958, AW973723, AW975134, AW972783, AW979211, AW969769, AW979037, AW969756, AL119418, AW975084, AW604726, AW969757, AL037051, AL036725, AW969843, AW976506, AW975132, AL119363, AW973175, BG059382, AW979162, AW973270, AW970113, AW971387, AW973770, AW972884, AW973189, AW973202, AW972695, AW973805, AW972719, AW976515, AW975976, AW979165, AW976510, AW975975, AW969884, AW975973, AW972943, AW969759, AW979083, BF592735, AW970587, AW973650, AW979175, AW975646, AW969931, AW973986, AW979064, AW975938, AW975016, AW973185, AW975138, AW975968, AW970921, AW969766, AW979116, AW972806, AF086120.1, AB026436. 1.	
HDTFE17	146	1043391	1 - 1228	15 - 1242	BE273962, AW675159, AA621888, AA621871, AW748710, BE151868, BE151889, BE151869, BE151849, BE151872, BE151870, BE151871, BE151873, BE151864, BE151839, BE151843, BE151866, BE151846, BE151874, BE151850, BE151861, BE151882, BE151862, BE151890, BE151845, BE151844, BE151885, BE151854, BE151841, AW748711, BE151847, BE151865, BE151886, BE151969, BE151887, AW748719, BE151842, BE151883, BE151963, BF350425, BE151880, BE151851, BE151968, AW748716, BE151904, BE151853, BF350436, BE151840, BE151905, BE151907, BE151884, AW748723, BE151901, BE151974, BE151966, BE151964, BE151848, BE151912, BE151897, BE151888, BE151902, BE151896, T56553, BF350423.

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HDTGC73	147	635457	1 - 698	15 - 712	AW022607, AW511178, AI140427, AI971228, AI373655, AI580779, AI369886, AI190934, H40803, AI243231, AA453827, AA453746, BF446909, BE326968, AA961079, AA040716, N47998, AI819706, T56239, H39994, BE670797, AI749775, T56381, H43297, BE464767, AA988630, AA974652, AA442300, BE327694, C01257, R49917, F34030, R17933, AA987718, AW440024, AI018768, BF942310, BF446776, AI240357, AI400446, N24874, N78913, AI694117, AI002282, R49918, AI685705, BF942188, BF942316, AI972263, AA437235, AI498099, H39563, BF964549, H43296, T47759, AW900854, AA968952, BE887988, N51205, T47760, AW779345, AA040717, AI873997, R18029, AA933016, BF885380, AI687282, AL096888. 30.
HDTT10	148	839264	1 - 1186	15 - 1200	AI083677, BE743996, BE743947, AU160678, AW664068, BE349558, AW628596, AI571248, BE855557, AI074410, AI187067, AI570161, AI369658, AI911489, AA847560, AI858954, BF061712, AI633548, AI797227, AW131565, AA740410, AI523334, AI016601, AI381898, AA456612, AA044598, AA059399, AI459164, AI090345, N35134, BG222539, AW167314, AW573046, AW189552, AA909759, AA937341, AA507905, AA029634, AA402030, AA857843, H50249, AI040383, AI457950, AI017968, H49423, AA761742, AI024077, BF056436, AA454713, H41354, R53884, AI808070, AA983678, AA402973, AA757454, R89047, AA814131, H46258, AA503217, AA621290, AA484401, BF447031, R67742, AA805632, AW163079, R50125, R82044, AI948622, AA484466, AI356460, AI095617, AI910985, BF510966, H27862, H43711, AA935660, AA604173, BE139470, AA868478, AI468101, AA317664, AA554872, AI582858, R90731, H51590, AI243984, H43799, AI399885, AV697638, AA662796, AI417135, R53883, AI400568, AI298084, AI216579, AI399848, AA973892, AA455791, AI937339, AI147045, AI132122, AI809110.

1142.

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HDTMK50	149	1011485	1 - 1338	15 - 1352	AI862716, AV740009, BF681619, BF814446, AW955693, AI004591, AI754653, BF941382, AI040051, AW438542, BF984807, AW029515, AA582554, BE393367, AA579179, AA720732, AI733856, AU152964, AA584489, AA528390, AA602557, AL038936, BE019467, AW328331, AV721886, AV726332, BG222269, AW500029, BE294700, AW188662, AI037897, AA171941, AA503298, AI753037, AA535216, BF725844, AI366902, BE676915, AW575605, AL040054, AU152561, AA410788, AW976010, AW512196, AA584148, AI921765, AV764259, AI809818, AW970970, AV685117, AW515437, BF934301, AA121777, AW402458, AA804726, AI566408, AA812684, AW271904, AU118200, AI601229, AU156313, AI689198, BE156426, AV701116, BG222875, AV687683, AV685479, AI818332, AW963444, AI653776, AI292236, AV651051, AW407578, BF871476, AA644090, AW900516, AI628219, AU147341, AI963856, H79633, BE674952, R91911, AF312915.1, AL157838.24, AL161792.29, Z98200.8, AL133448.4, AL133371.3, AL161904.7, AL353668.18, AL161626.20, AP000247.1, AC005726.1, AC073073.2, AC007207.22, AL022324.1, AL445685.17, AC004212.1, AP000047.1, AL359091.10, AL162377.10, AP000115.1, AC006312.8, AL357515.26, AC003029.2, AL162272.10, AL050335.32, AC002544.1, AC002301.1, AC005332.1, AL132713.11,

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HE2DY70	150	722217	1 - 625	15 - 639	
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HE2EN04	151	545008	1 - 356	15 - 370	AW001928, AW079751, AW073814, AL754638, BG250988, AI884973, AI571035, AW440401, AW082774, AI888810, AW166812, AI250234, AA292765, AA883763, AA706968, AI375629,



HE2FV03	152	396139	1 - 2053	15 - 2067	<p>AW470061, AI367655, AI816708, AA866114, AA706948, N6757, AW103401, AI023713, H99221, AA143778, AA969210, W90744, AA877946, AI289492, AI446437, AI520961, AA604695, AW409669, AW770358, BF220234, AV660129, AA573448, BF698763, AA564001, BC000411.1, AF067656. 1.</p> <p>AL043591, AV726971, AA127856, BE503097, AI879075, AA917899, AI240219, AW958109, AW958106, BE221298, AI761889, AI042518, AW160850, AI750090, W38699, AW157481, AW161163, AA132116, AI565447, AW151293, BE890471, N94930, AI922328, BF476776, AI650737, BF668030, AA030052, AA907159, AW163661, AA127886, R26504, AW160606, R26476, Z33583, AA483553, AA922649, AA974552, AA029940, Z39533, AI700171, AA450258, AW472819, BF445592, AI572746, T30697, T31442, AA568420, AV748357, N55856, AA095728, AW952127, T36214, H89692, F04756, Z44852, C16580, AI873861, N71935, R40796, D62931, AA091396, F06009, F06010, BF927136, AA579325, AW663027, N56262, H89758, AL161449.7, AI001319.1, AF093419. 1.</p>
HE2NV57	153	740750	1 - 853	15 - 867	<p>C05927, R72949, AA327984, AC084730.2, AC016673.5, AC004929.2, AC016716.6, AC008066.4, AC003969.1, AC024082.6, AC002302.1, AC013246.13, AC011490.7, AL158064.16, AC084729.2, AC078851.4, Z98743.1, AC020610.6, AF195953.1, AC016910.5, AL359394.9, AC005227.2, AC003692.1, AC016776.6, AC002300.1, AL451107.6, AL157838.24, AL031737.2, AL050335.32, AC007690.11, AC004541.1, AL022401.1, AC018796.4, AL358913.4, AL008583.1, AC005868.1, AL133383.10, AC006070.1, AC006211.1, AL359680.4, AL158035.14, AC087072.2, AC009424.2, AL391686.10, AP001684.1, AC006013.3, AL356461.15, AC016598.5, AP002980.2, AL158817.11, AL035685.21, AC034251.5, AC006134.1, AC020906.6, AL391241.21, AC015983.7, AP003470.2, AP001889.4, AL357519.19, AC087430.2, AC005081.3, AC005886.2, AC018509.5, AF277315.3, AC010913.9, AB020875.1, AJ011930.1, AL163300.2, AP000952.2, AL133387.8, AP000953.2, AL162503.12, AC025765.5, AP002342.3, AL445232.5, AC023114.5, AC004891.1, AL355792.8, AL163280.2, AL109662.3, AC010206.8, AL049843.18, AC017076.14, AC009362.8, AC005015.2, AL096791.12, AC002487.1, AC010726.4, AL353752.6, AP002846.2, AC005344.1, AC022363.24, AC009498.3, AP001699.1, AL138976.5, AC008064.2, AL357507.9, AP001670.1, AL137061. 12.</p>
HE2PD49	154	638617	1 - 1408	15 - 1422	<p>AI143226, BF792379, BE798123, BG027947, BF512811, AW960702, AA074614, AW973179, BF793801, BF970034, AI816250, AI336874, AI359462, BF196595, AI920941, BF683421, AW404001, AA041535, AI619673, AW080448, AA312966, AI248170, AA552215, AI864909, AI161255, AW027101, BE393360, AA613058, AA953791, R54079, R60168, AA426568, AI697713, BF208847, AA082536, AI269146, AA989378, H21497, AA877154, H98486, AI206064, BE563486, AI582707, AI587399, BF677141, BE396204, AI144140, AA527643, AI282213, BE832689, AW574900, AA376459, H29536, AI200580, AA329522, AW662882, BF213405, AI927727.</p>

					AA318044, AI263946, AA039912, AI223111, AI912507, AI829375, R49273, BF842875, AA091789, F36491, N40052, R39339, AI557366, T24757, R43134, AA425093, AA873687, AI816330, AI266123, AW361339, R60167, AW996248, AI872739, AI561274, BE714961, N31309, F31801, R17888, BF904855, H29628, BG119615, D26032, C00043, N27118, AI005232, AI052315, AA301581, N22922, H39166, BC004878, AI, AF353991, I.
HE2PY40	155	753229	1 - 1274	15 - 1288	AA330504, AC000397, AF100978, X84749, AF170890, AF100973, AF100970, AF100962, J05175, AF134415, AF134412, AF134413, AF134414, AF021846, AF071831, AF134416, I.
HE6EU50	156	411998	1 - 1138	15 - 1152	AA702142, AI078434, AA069425, R10241, W86987, AI902844, R10745, R10723, AA069424, AI902901.
HE8MH91	157	589450	1 - 1747	15 - 1761	BF969305, BF059262, BF434869, AI761909, AW137210, AI283077, AI625814, AA910871, BF028374, AU145480, AW103833, AW978231, AA179892, BG111607, AI751270, AU157325, BF970781, AA169699, AI818898, AA169226, AA180424, AA744012, AA806038, AU153225, BF445787, AA630387, AI185702, AU119050, R69144, AA282527, R69260, AA332623, AI625888, AA282635, AA968997, AA744320, AA044588, AW513757, AA196702, BE089435, BF154666, AA248976, AA720672, AK023183, AK000289, AB055279, AK002033, I.
HE8QV67	158	1050076	1 - 1985	15 - 1999	BG119583, BE746475, BE745466, BF309488, AI361796, BG170779, BF966754, AW958421, BE617929, BG113523, BE394923, BE858188, BE731439, AA535135, AA236263, AW958336, AV752251, BE222593, BE797087, AI378612, AI634494, AA742437, AI199786, AV752842, AI669796, AW571509, AA063366, AI291989, AW004941, BE208151, AV704111, AI871167, AI540336, AA641240, AI288465, AA995997, AI218558, AW803217, AI083642, BF310733, AI435447, AW000866, BF934819, AV702400, N58967, AA136332, AA401608, BF433811, BE044647, AA868416, AW249910, AW627730, AA070405, BE908878, AA805715, BE717281, AA731211, AA844218, BE829627, AA725610, AA401477, BE829527, AI299157, AA648375, AA670304, AA709453, AA283820, AA970204, AW771046, AW249690, AA235005, AI928576, BE829555, BE829559, AW780342, AI017819, BE829626, H72154, AI750471, BE767520, AI571553, AI493322, R49561, AA875884, T70282, AA621993, T92727, AW469575, AI081826, AW449174, AI917238, N99124, BE836842, AA354609, W81566, AI033218, AI357261, AW104863, BE829551, AI445295, W81613, AI983491, BE717246, T08002, AA890368, AV707554, T03334, AV707204, AI445295, W81613, AI983491, BE717246, T08002, AA890368, AV707554, T03334, BE717260, BE836791, H72067, AI359915, BE836784, AW166060, BF834444, AA393274, BE836790, AW949521, AA736679, AA760993, AI085191, AW079503, T91829, AA136418, AA844211, AA725212, AA398623, H72162, BF590157, BE717249, BE717270, AA309678, BE829551, AI301810, BE717253, BE717247, AI000601, BE829537, W96196, AI200943, BF343587, T81071, N57909, AI419052, AI672790, H43667, BE829547, AA721731, AV708653, AI581665, AI208088, R60516, T35798, AW997309, T09191, T92806, BE717235, BE717244, H44738, R44088, AV685266, R30891, AA223393, BE791873, T32074, AW958289, BE000527, BF002298, AW080583, R30822, D80992, AI453195, AI937049, AI004756, AA446567, AI077535, AI291831,

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HE8UB86	159	834913	1 - 1007	15 - 1021	AI953328, AI934602, AW954535, AL536231, AU158601, BF984471, AL524237, Z45020, AA367897, AA367866, AA349373, AA349622, AA160958, AA436773, H08134, R18172, AK024378. 1.
HE9BK23	160	675382	1 - 1622	15 - 1636	AW299658, AV659209, AW058550, A1796131, AW299514, AV658836, AV653227, AV654722, AV682016, A1767984, AV647576, AV649623, AW614624, A1634858, AW235128, A1498692, AV649245, AV693284, AV659141, A1373251, AV653105, AV658636, AV688654, A1796532, AV657125, R86161, AV647536, AV647454, AV660968, AV654145, AV684193, AV659149, BE971322, AW295829, T73510, T73442, AV699707, AV685476, BF740041, N71226, AV726104, C15737, AV706064, AV706545, AV702961, AW962458, AV703159, AF152562. 1.
HE9CO69	161	596829	1 - 1063	15 - 1077	AL517134, AL537534, BG120134, A1361222, A1361218, BG168891, A1818146, AW955091, AL044002, AV719782, AW510853, BF699219, A1937067, BF216510, BE927666, AW292803, BF335422, BE549610, BE927669, BF680792, BE881703, A1444975, BF085414, A1809804, BF674861, AA643669, AL044003, BF085327, AW571754, A1870371, A1333293, AW804029, BF367442, A1027392, BE825418, AW804094, BE814966, BE004566, AW804040, BE814989, AW804038, BE178594, BE814978, BE694316, AW804031, BE815035, AW804096, AW935907, N51364, W52337, A1140675, A1159864, BE178632, A1949007, AA449305, A1279860, BE927615, A1912517, A1056498, N66531, BF085618, A1344560, A1571128, AW887696, AA448734, A1937064, AA908864, BG150261, AA620750, BF085472, BE004562, BF197164, BF689123, AW102597, AL524051, BG150351, AA515676, AA845306, BE178588, BF433188, AA084404, AA448757, A1825137, BE178649, H12900, A1356775, BG167519, AA523074, AV756035, W49814, AW189236, AA448798, BF516003, H99378, A1313393, D82523, AW804120, A1517135, N89941, A1830723, AW887703, AW887694, N57002, BF085413, A1348377, A1423892, BE004603, AW887709, AA961085, BF085333, A1380140, A1423619, AA772080, D82499, A1244153, D60492, N64261, A1225085, BE089349, AA907447, BE089348, AW001668, BE825346, BF352382, BE089337, BE815028, A1289220, AW241615, AW052165, BG168918, R48783, BE814984, A1767167, AW472798, BE815055, A1423765, H00809, D57482, BF327548, R17701, R16274, R15770, AW024854, R28195, D82446, N88488, F09950, A1655533, H08546, Z30216, T30774, H12901, BF327564, BF037045, D82493, C02460, R28196, D57590, AW089369, BF111213, BF68534, T95086, BF437738, BF677346, D82563, BF327550, R38734, A1268405, AW440038, BE004951, T34027, W33131, H16803, BE004551, R56288, BF691993, BE927656, BE004811,

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HE9CP41	162	560625	1 - 1378	15 - 1392	BF032830, AL121944.14, AL138700.18, AL132988.4, AL138805.8, AC018695.6, AC005305.1, AC015853.8, AL049637.43, AC005536. 2.
HE9DG49	163	1299935	1 - 703	15 - 717	BF508798, AI829099, N25625, AI126506, AI200037, AI128843, AW024969, N34223, AW450603, AA743134, N36303, AW020616, AI217597, AA605122, AI160533, AA729493, AA568193, BE857354, AA568681, AI695490, BE855663, BG054946, N26904, N24885, W52651, AI802647, AI312534, AA648514, N72137, N35103, AA806507, AA729125, N34254, AI219599, H86995, N39790, R73200, N26781, AI032141, N25653, H86994, W00385, R73137, AW298649, AA296449, N28403, R26304, AW452862, AW453038, AI299683, AA988539, AI141901, W52017, AI039557, AW236299, AW515490, AI361669, AI674252, AA768761, AI452444, AW629545, AI984739, AW074182, AW583163, T25829, AI805445, N20053, BF958127, BF964329, AA543074, BE081422, T25828, AA358828, BE152130, AA653691, AI362330, AW606102, BE170656, AF238079. 1.
HE9OW20	164	1352337	1 - 1195	15 - 1209	BE738133, AA223584, AU152161, AW297936, BE242781, AU130144, H54044, BE154665, AI312278.1, AC046130.25, AK027657.1, AK023061. 1.
HE9RM63	165	886167	1 - 2135	15 - 2149	AU133294, AI057619, AI815558, BF949735, AW272417, AI631144, AI083492, BF696663, N53095, AI922624, AI016358, AI791895, AW439093, AA377170, AW238991, AV733682, AI634595, AI280306, AA326937, AI816503, AK001735.1, AF227906.2, AL162500.15, AL158192.15, AL133051. 1.
HEAAR07	166	561524	1 - 1070	15 - 1084	BF035327, AI436352, AW903499, BF839884, AV731158, U49973.1, AL136168.4, AC018719.4, AC010386.5, AC026463.4, AL356859.12, AC025097.41, AC010485.5, AC006343.2, AF222856.1, AF222854.1, AF042484.1, AF222855.1, AC005728.1, AC012081.16, AF241734.1, AL158201.19, AC022392.4, AL118557.5, AP002500.4, AL031671.12, Z82975.1, AL139182.24, AP001533.4, AC005317.1, Z98745.1, AC079319.19, AC005411.1, AC004941.2, AL445204.3, AC006566.2, AC005678.1, AL357394.11, AL356094.11, AL356534.12, AL359703.13, AP000893. 5.
HEBAE88	167	526417	1 - 568	15 - 582	AI732427, BF445282, AA129395, AW880236, AA065052, AC004478.1, AC004388.1, AC010722.2, AC007511.8, AL450333.13, Y08991. 1.
HEBBN36	168	486120	1 - 1032	15 - 1046	AW965787, AA426185, BE669482, BE504215, AI823764, AA400753, AW183532, AA099541, AW994875, BF131705, AA676425, AW450178, BE835748, AA693746, AI168628, R26928, BF331783, AA356625, BG150194, AA954744, AA903008, R26705, BE138808, BE019804, AC005180.2, AC002557, AC002557, AC002557, AC005180.
HEBCM63	169	484643	1 - 544	15 - 558	AW138816, AI907676, AI360241, AW341219, AI360299, BF477880, AL119663, BF928245, Z38680, AI937380, AI557264, AA170832, AV741220, AV745417, AI524890, CI5120, CI51762,

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HEBEJ18	170	701802	1 - 671	15 - 685	6.	BG119433, BG248347, BG109710, BE383397, BF310661, BF035847, BG111960, BE740887, AA872710, AW051637, BE904996, BE260053, BE294553, BG026514, BF036166, BE378983, AV716604, A1300158, AV710056, BE257692, AW778814, BE879729, BE258999, AW592818, BE261359, AA044747, AA044799, AA878925, A1921790, A1469932, AA947927, BE251176, AA058505, BF245674, AA934688, BF310228, BE567185, A1299177, BF312584, BF243996, W38688, A1453622, AW749554, W95793, A1277337, BE271728, AA903577, AW874395, A1309289, AV712772, A1085685, AW118921, W95680, A1948425, AA934482, A1303007, AW601910, A1419931, BE440006, AW342036, AA053139, AW291750, N92290, AA962740, AW749576, AW954824, AV737047, AA055227, AV713230, AW749583, BF304421, T87073, A1371426, AV756120, AV681938, BE794262, A1143381, A1097662, BE258966, AA037518, N25835, AA912713, H71267, W80906, W80813, AA315305, AW374030, AW300889, AW300782, BF909052, AA037362, A1247237, BF336991, AA657605, AA541343, AA878777, W24468, T81887, AA054464, AW374000, BF216378, A1016169, AW374003, AA055226, AA213429, AW384982, BE067202, D20873, A1831636, A1038897, AW795930, BE327096, W31033, BF036705, W86895, BF792783, BF513528, T87074, A1361634, A1311824, BG036220, AW302965, A1307446, A1345737, A1345736, AV735576, A1345666, A1335476, BC000573.1, AK024569.1, AL136930.1, AL590002.7, AB060912.1, AL136754.1, BC008485.1, AL137294.1, AK024978.1, AL137459.1, AK000718.1, AFI55827.1, AL117460.1, X72889.1, AL389939.1, AL080156.1, BC003104.1, AK000445.1, AK025632.1, AB056421.1, AL080148.1, AL133104.1, BC007920.1, AL136747.1, BC006458.1, X86693.1, AL137523.1, AK026408.1, BC004951.1, AL050172.1, AL122098.1, BC008649.1, AK026642.1, AK025209.1, AB046642.1, AK025312.1, S77771.1, BC000725.1, AF002985.1, BC006119.1, BC008387.1, AL512746.1.
HEEAG23	171	684254	1 - 1655	15 - 1669		BF667852, AW798053, BG141339, A1279852, BG141348, H57654, A1472339, H85172, BF879975, BF879989, BF879974, AW954063, AW994019, BF590284, AA383569, H96534, BF800241, AA903404, AW873530, AA719530, A1084916, AW135894, AA993772, BF358415, AA890589, BG249829, W61170, AA807443, AW498471, AA814409, BG149771, A1828884, BE839816, BF954921, R76166, BE545018, AA470533, BF922076, A1829062, BE766575, BF808213, AA737653, H96878, R62923, AA714658, BF808212, AA703115, A1964064, AA569749, A1343340, AC004938.2, AL357033.19, AL121808.4, AL135749.3, AL359402.3, AC009314.4, AL031777.4, AL035079.14, AC078818.19, AL358612.8, AC018644.6, AL391839.9, AC013716.6, AC004882.2, AL078591.18, AL078645.31, AL031680.20, AL162505.20, AP001715.1, AC025264.16, AL109938.8, AC006312.8, AF243527.1, AL133367.4,

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HEEAJ02	172	633657	1 - 1024	15 - 1038

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HEEAQ11	173	777843	1 - 907	15 - 921	<p>AW572915, BE500968, AI631708, BF056783, AI638675, AW024125, AA812885, AA911102, AI651682, AA758532, AA934362, AW104268, AA968716, BF223496, AA496078, AA608859, AA973942, AW418725, BE041425, AA931770, AA513329, BF056762, AW975618, AW949645, AW964468, AW966389, AV724520, AW966330, AW973541, C14331, AW960553, AV718692, AV702035, D80195, C14389, AV718489, AV719468, AV718800, AV719822, AV719324, AV718707, C14429, AV718931, AW366296, AA303409, AW966534, D59619, D80210, D80166, D80240, AW973488, D81030, AW949656, AW949642, AW965185, AW965197, AV720211, AW966075, AW978634, AV723927, AW966065, AW949653, AW962245, D80212, AW966053, AW959799, D80219, D59859, D51423, AW973474, AV699550, AW966050, AV719783, AW975613, AW965196, AW965184, AW978661, D51799, AV720464, D80253, AV718770, AV720731, AW966029, AW973307, D51060, AV718938, AV718633, AW975605, D59610, AV720878, AV719557, AW960465, AV699447, AW958993, AV722801, AW973334, AW959136, AW966531, AW949646, AW949654, AW959202, AW966013, AW960473, D58283, AW966022, D80022, D80366, AW964756, AW975621, AW964477, D80188, AW966041, AW965163, D80391, D80164, AV718844, AW959582, AW966054, AW966059, AW958992, D59787, AW978648, D59502, D59467, AW949631, AW949643, AW949618, AW949655, D59275, AW960454, AW973330, AV720791, AV720203, AV719188, D80043, D80227, AW966062, AW956434, AV718440, AV720028, AW959597, AW959628, AW965177, AW959570, AW973485, AW965175, AW973482, AV700229, D57483, D59889, AW959062, AW964488, AW949641, AW962082, AV699927, AV738340, AV723097, AW966043, D80269, D80196, C15076, D80024, AV699866, AW949658, AW949657, D80241, AW956397, AV699746, AW949629, D59927, AW375405, AW964737, AW973447, D80038, D80193, D50979, D50995, AV700889, AV744690, AW949630,</p>

					AW966030, AV720150, AV721386, AW965158, AW949633, AW949632, AW966032, D80378, D80045, AW753053, AW966023, AV718530, AV720812, D51022, C14014, AW960532, AV701004, AW960564, AW959469, AW960504, AW177440, AW744012, AV720533, D80248, AW975623, AW973490, AI905856, AV701125, AW752082, AW962395, AV701166, AV701149, AV703738, AW973445, AW964532, AW966368, AV720151, AW966397, AV720220, AV705869, AV720616, AV742732, T03269, AW973465, C75259, AW960570, D80133, AW178893, AA305578, AW966369, AV699669, D80302, D80251, AW973473, AW965176, AV727978, D81026, AA514186, AW966378, AW966386, AW966331, AW966398, AV706147, AV719913, AV720654, AW966399, D80522, AL121894.26, AF058696.1, AF271371.1, AB028859.1, X67155.2, D34614.1, D88547.1, AB002449.1, D50010.1, AB038216.1, U79457. 1.
HEGAN94	174	885637	1 - 568	15 - 582	AI018488, BF509739, AL157823. 9.
HEGBS69	175	1093342	1 - 795	15 - 809	BE041526, BF514935, BF515526, BF515928, AI656756, AL138127, AI150056, BF510812, AW165981, AI360220, BE963568, AL512683. 1.
HELGK31	176	681138	1 - 1382	15 - 1396	AL519840, AL519839, BE379142, BE786389, BE796190, BG117991, AL524590, BE744597, BE909841, BE907873, AL043167, BE544763, BE740216, AL518390, AL529705, AW592682, AW874363, AI085412, AW958434, AU126873, BF132076, AA604374, BF541758, BF794982, BE545432, AA936378, AA161264, AA531252, BE563799, AW072533, AA639981, AA677594, AI138280, AA218539, N94446, AI363012, BF114843, AI083837, D51047, BF343738, AW499697, AA437204, AA132746, AV712240, AI086913, AA889889, AA161263, AA916429, AA142878, AL518389, AA810233, AA613892, AA424834, AA143152, AA603133, AA132651, H11615, AW367012, AI268931, AI955333, AA948407, AW327686, AA856621, AA227183, AA524602, BE537412, W30793, AA969047, BE875215, AU149648, R54573, H18393, AW080718, AI082408, AA354603, BG024936, AA807409, BE762990, AA225683, AA745633, R09626, W22670, AA296971, N79058, AW131898, AA283047, R09625, AA974359, AA216343, AW352289, AI014772, AA426455, AA335199, AW352287, AA876045, AA569616, AA426587, AA365881, BE645623, AW352294, AA218538, AA225708, AW149303, Z45742, AA298844, AA693654, Z41394, AI740665, BE142815, R09514, AW263934, BF515182, AA652379, W24000, AI400292, BF893436, AA281197, AI376646, AV703989, AV725633, AV656373, AV702372, AV702417, AV704217, AV702280, AW954248, AV702998, AW950443, AV725991, AW960601, AW952403, AW952410, AW952183, AW954237, AW952751, AV645936, AV709587, AW955723, AV658084, AV692600, AV650315, AV659389, AV697880, AV727613, AV726010, AV660258, AW959521, AV647789, AV708109, AW956474, AV659294, AV727787, AV703146, AV725745, AV686060, AV660608, AW951239, AV728148, AV726590, AV709314, AV653353, AV654070, AV691080, AW951281, AV702385, AV702772, AW949802, AV658275, AV652001, AW955662, AV703669, AV707979, AV725208, AV727003, AV709580, AV725582, AV708786, AW957517, AV659547, AV727526, AV651920, AV725618, AW954439, AV706734, AV729076, AV702266, AV725577, AV725033, AV706223, AV728924, AV725617, AW954206, AV707863.



					<p>AV696931, AV707798, AV703062, AV727822, AV707572, AV699089, AV705135, AV701874, AV703501, AW962444, AV707401, AV701183, AV709660, AV704585, AV654035, AV709935, AV707652, AV728721, AV707654, AV707663, AV683994, AV704042, AV654282, AV697288, AV729220, AV709880, AV687035, AV698290, AV704847, AV694836, AV706882, AV697498, AV702954, AV727238, AV686420, AV694812, AV682997, AV696866, AV727126, AV707656, AV655890, AV728997, AV706162, AV705635, AV686390, AV702794, AV656256, AV686417, AV686083, AV698429, AV656240, AV655577, AV694871, BC001239.1, AF201931.1, AK001341.1, AL136674.1, AL137878.11, AF217994.1, Y08991.1, Z30183.1, U94592.1, U45328. 1.</p>
HELHD85	177	847372	1 - 1872	15 - 1886	<p>AL284640, AL138265, AL046409, BF677892, AW193265, AV760937, AW969629, AL431303, AV760777, AL13280, BG249643, AW407578, A1281881, AV763354, BF130107, AL345654, AV728425, AW502975, AW965008, AL334443, AV710066, AW419262, AL350211, AL801482, AW473163, AW238278, AL754658, BF668217, AF330238, AL754253, AV762139, AL963720, AV725423, AV728928, BE895987, AW303196, AW274349, AL119691, BF681427, AV762098, AL133164, AW438643, BF827410, AA581903, AW970848, AV762009, AL270117, AL076616, AW301350, AL045053, AW765393, AW021583, AW833862, AW276435, AL138455, AW974109, AW439558, AW327868, AV762050, AV729960, AL041690, AW276827, AL890348, AL567076, AV761362, AL044940, BG109996, AW004911, AF074677, AA720702, AV764578, AV761489, AL305766, AW500125, BE047069, BF970654, AU145393, AV735495, AW731867, BG236735, AV764398, AL421841, AL042753, AW960468, BE206443, AL624142, AA621858, AV761925, AV759172, AV702857, F36273, BG222267, AA164251, AL799642, AL249997, BF793664, AU147104, AV708009, AV763971, BE389111, AV734666, AV762067, AA491814, AV761106, BF697673, AL434695, AV740801, AV759117, BF241967, AW265385, AW062724, AV763122, AW265009, AL037683, AW103758, BF940837, BE350475, AL305547, BF475381, AL121235, BF337291, AL192631, AL821271, AA469451, BF942454, AL042420, AL341664, AV710774, AL053672, AW973397, AL623720, AL903462, BF680074, BF793766, BE674881, AV763550, AL048925, AV760042, AW073470, AL679782, AL046205, AW963497, BF681576, AL457397, AW662543, BF797630, BF592311, AL471481, AA610491, AW088846, AV733830, BF965007, AA526787, AV759505, AV730310, AW302013, BG036665, BF541116, AW301809, AV764530, AL038474, AV761631, AW021207, AV762959, AV762395, AL289067, BG171096, AW270382, AV763633, BE042649, AW338086, AA491284, AA908687, AA551552, BF674620, BE160516, AW410400, BG178002, AL133102, AW083364, AW872676, AW088202, AL1919265, AL801600, BF792870, AW979060, AV762535, AA630362, AL119984, AL688846, AA631507, AL537506, AV743472, AL801591, H56509, AA584145, AL132309, AL732865, AV764329, AA521323, AL937850, AW574794, AU145711, AP001423.1, AP001731.1, AP000021.2, AP000163.1, AC004765.2, AL391803.14, AL122001.32, AL139809.16, AL354932.26, AC006128.1, AC018720.5, AL160155.19, AC005696.1, AF207550.1, AE006462.1, AL158207.15,</p>

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HELHL48	178	696945	1 - 2957	15 - 2971	<p>AL160411.25, AC073520.6, AL035404.20, AC034198.6, AL031650.22, X53550.1, Z83840.7,</p> <p>AL529435, AL524123, AL524122, BF312538, AU129727, BG164871, BF348048, AU120482, BG167168, BE733600, BE876571, BE875645, BE296592, BE901138, BF343028, BF308771, BF345199, BF308189, BE336871, BG028125, BF115264, BG116986, BG249650, BE903726, AV728373, AW007132, BG121227, BF206051, AW963600, BF347698, AU151806, BE294229, AW303548, AW411067, AW967356, AW411066, AU128086, AU100522, A1867409, AU137055, AU378902, W28880, AW752755, BF308950, AW751506, AU421175, BG180673, AW590377, BF001722, A1872412, BF924126, A180518, AU373035, AW179322, A1401197, R24305, AW178945, AW150193, AA209515, AA564224, A1370802, A1984047, BF438508, AA293441, AA088551, A1758667, A1275100, AW996404, AW007984, A1800710, AU150189, A1361596, AU150403, AA669849, BF432420, A1559326, AU146534, AA514455, AW513096, N31325, BF754347, AW896670, BE789836, A1299591, A1272929, A1089779, BE008621, A1912569, A1276235, A1283742, BF939706, AA508685, A180517, AW169281, A1688823, A1310354, AW007978, A1359948, A148446, AA292742, AA478976, A1041725, BE790438, AA292741, A1221864, A157827, AA552023, A1112746, AA513477, AA232508, A148445, A1493536, BE206110, N26490, BE147464, AA293508, T84545, BE093924, BF884193, AU157002, F12444, A1348568, D31225, N47540, A1269318, BE147790, AA088385, T74066, AA053180, H30187, AA654655, BF154572, AW579667, T88004, T35342, A1074255, AW571550, BG055222, AW579684, Z39831, BF434566, AW390755, AV698355, Z43770, AV685886, BE463536, AW270979, AW378596, AW514887, T31997, AA863225, BE296813, H04167, A1246176, AA365514, AA513359, AA477913, T34879, BF347090, BF438580, A151938, AV684774, AA336395, AA492462, AW009840, AA053627, BF906710, T87910, A1470954, BF814719, BF593969, T64888, A136495, A1179793, H08606, AA907036, F10066, AA503814, R22025, AW577064, BF749344, AA298224, AA339096, AA079476, T35287, AA936508, A1620090, AA079475, AW378971, T39180, F08643, H08605, AA372556, AA995437, BE294737, AW300420, AA496416, R01535, BE311798, AA345134, R44902, R22078, F02150, R49987, BE840622, T35182, AA369833, A1244019, BF947140, R00876, BE840609, BE294732, H04166, AA887342, BE143234, N47539, AW374684, T31964, AW178632, AA635427, A188708, AW582129, R47850, AA152055, BF476766, AW291610, AA369871, AW451289, BE467357, A1630981, AW134630, BE763447, A1383035, BG255592, T58576, AA248989, BC003128.1, BC006200.1, AK001112.1, AL161962.1, BC000035.1, AK001524.1, AF151847.1, AK001424.1, AL359542.13, AL034405.16, T38537, AA232607.</p>
HEMAM4 1	179	741647	1 - 1323	15 - 1337	<p>AL515525, BF966744, BF793066, BE905040, AV697070, AW157314, A1816071, AL515524, AW261874, BF966307, AW163370, BF727408, AW151173, AW001897, AW236835, AW235694, A1801254, N62855, A1815990, AW117364, AW976507, AW150293, AA876913, A1635914, AA779526, A1584106, R40658, D12158, AW148443, AA338451, AW166670, A1245076, D12218,</p>

HEPAA46 HEQAK71	180	596830	1 - 1115	15 - 1129	AW369838, D57788, AW631476, AA969485, AC021086.4, AC027315.3, AC010382.4, AA835052, A1220434, AA335178, AA905529, AL031650.22.
	181	598018	1 - 1675	15 - 1689	AW960453, AA577682, A1740956, BF589404, A1810888, BE894896, A1129260, A1743307, A1953066, A1017271, AA631231, BE503649, A1400945, A1670754, AA534344, BE765639, W72296, BE673403, A1188476, AW264555, AW880277, AW305140, N54915, AA917732, A1439508, BF510644, BF984766, AA088886, AV750742, BG109860, BE765623, H01968, AA573814, T69918, A1758231, A1479210, A1738022, AV751020, BF437113, N40587, N25881, R36078, BF989181, BE897314, BF574472, AL036615, AL117461.1, AK026979.1, AC011093.6, AL359709.15, AP001437.1, AP000011.2, AL390798.3, AP001728.1, AC005345.1, AP000153.1, AL078645.31, AL137021.15, AC004817.2, AL357117.20, AL442183.4, AC004830.1, AL354696.11, AC003013.1, AL138743.5, AL513023.12, AC012405.5, AK027165.1.
HEQCC55	182	1352368	1 - 986	15 - 1000	BF344112, BE275042, BE275057, BE563860, BE876310, BE880309, BE910481, BE733268, BF526321, BG169508, BE876530, BE878582, BE384718, BE562629, BG170369, BG170840, BE304867, A1492143, A1768116, BE876850, BG164974, BF338794, BE274902, AA149044, AW204761, A1768403, A1221536, BE395085, BG032898, AW172990, BG248912, AW051452, AW262030, BF114971, A1800959, AW338518, A1827127, A1568941, A1761510, F25336, A1313436, A1086734, N41733, AA994944, AW938942, BF063028, AW628237, A1219327, AW859588, A1718198, BF108787, A1004154, A1864228, BF197631, A1767239, AW001699, A1796303, T56712, AA576558, A1911799, AW149867, A1470703, AA149043, BG236779, A1470484, N83862, BG249788, AA631934, A1270718, AA610401, A1813825, A1401800, A1358289, A1799902, H95227, AW166567, A1264959, A1611273, R48167, BE730123, A1867518, AW815436, AW815444, BF338447, AW391445, AW815697, A1167239, AA970894, AW815514, T74424, BE076102, AW815626, BE076131, BG168390, BG169301, A1910684, A1189491, BE075966, AW843216, AA386018, BE076032, AA873480, R33355, T74049, BF338531, BF734770, A1919408, A1858303, A1701259, D29265, BF331419, BF982285, BE042437, AA996249, BG002211, AW374913, BC002718.1, AF191148.1, AB035480.1, AC004643.1, AB035481.1.
					AL121901.20.
HERAD40	183	560633	1 - 976	15 - 990	AC007358.2.
HERAR44	184	566811	1 - 406	15 - 420	
HESAJ10	185	526013	1 - 1076	15 - 1090	BG163863, BF973568, BE905545, BE440123, BE877406, BE878414, A1810399, AA421950, AW954926, A1826072, AA507017, A1597673, AA147367, W46280, AA586621, W70172, BE879100, AA595444, AA725205, A1701337, AA421951, AA722808, AA988274, AA844455, W96316, T59591, BF869408, BF858292, BF858296, AA587061, A1077904, BF858302, AA147419, AA058506, AW579978, AA649904, AA651755, A1738387, R24354, A1077596, AA576389, A1734990, AA319027, BF858301, AA034247, AA054465, AA814555, W69907, BE833571, BE159104, BG170925, A1918084, W96221, AA326962, AL048246, AL048247, BF834026, BF339936, AA626906, AA897619, A1826118, BF363870, AA683597, AA932608, AA046341,



					<p>BC002688.1, AF162270.1, AL080060.1, BC002409.1, AK025375.1, AK026741.1, AF218023.1, BC003548.1, AK025524.1, BC006465.1, AL133072.1, BC001082.1, AL136799.1, AF261134.1, BC008930.1, BC002752.1, BC008781.1, BC008649.1, AF159141.1, BC002519.1, AL137530.1, AK026522.1, AL117626.1, BC004395.1, AB049880.1, AL136889.1, AL359601.1, AB050431.1, BC007198.1, BC002481.1, AF106862.1, AL389939.1, AB051158.1, AL137536.1, AL122098.1, AL137705.1, AB044545.1, AC026431.3, BC004943.1, BC004426.1, BC000051.1, AK024594.1, AL136615.1, BC002373.1, X69819.1, BC008280.1, L30117.1, AB060916.1, BC007355.1, AK027146.1, BC008785.1, AB060903.1, AL512719.1, AB056768.1, AC008507.8, BC005015.1, AK027104.1, BC007462.1, BC006164.1, AK027204.1, BC002631.1, AB052191.1, BC006136.1, AL359615.1, AB062978.1, U75370.1, X53587.1, BC008455.1, AB049848.1, AF111112.1, AF276658.1, BC003410.1, AK024538.1, Y14040.1, AB049849.1, AK026528.1, AB047623.1, AK000137.1, AK027082.1, BC007391.1, BC004951.1, AL050172.1, BC007241.1, Z82022.1, AF217987.1, AF202636.1, AB048975.1, AL136792.1, AK000421.1, M86826.1, AK027188.1, AL389947.1, BC003684.1, AL353940.1, AL050393.1, AL136784.1, AC026464.6, BC008070.1, AL049460.1, AB056427.1, AK027213.1, BC006472.1, BC000713.1, AF151109.1, AB063038.1, AL136780.1, AK026551.1, AK027136.1, BC002777.1, AL117648.1, AL136928.1, BC008673.1, BC001166.1, BC003052.1, BC003650.1, BC006412.1, AL133070.1, AL122104.1, AB063008.1, AK027161.1, BC004256.1, AB048914.1, AL136644.1, BC006458.1, AK026571.1, AB048974.1, AF305835.1, AB044547.1, AB048995.1, Y14314.1, BC004244.1, AF252872.1, U00686.1, BC006207.1, BC000054.1, AF040751.1, AK025484.1, AF044323.1, AL389951.1, BC003122.1, X65873.1, BC006133.1, AL136805.1, AL133665.1, AL359618.1, BC006807.1, BC006414.1, AL121828.17, BC000077.1, AK026532.1, BC004533.1.</p>
HETAB45	186	609827	1 - 1662	15 - 1676	<p>AL520667, BE737374, BE734304, BF689505, BF343502, BG179655, AW953641, BG168504, BE747867, BF982990, BE378257, BE514593, BE909615, BE870978, BG058649, BF689070, BG029850, BE546131, BF690427, AL688113, AL554392, BG115902, AW580475, AA911109, AA778384, AA486370, BF874009, AJ382028, AA776265, AW173438, AW382483, AI523553, AA563686, AI493765, AA906681, AA484857, AW752131, AJ362311, AA811238, BE047437, AI276177, AA838288, AA479791, AA460659, AA259052, AW580486, AI097482, AA488079, AI082243, AA088205, BE763979, AW510339, AI609703, AW404956, AI093069, AW438882, AI350871, AI953839, AA285058, AW366250, AI033274, BG029140, AV683434, AA648139, AA226399, AI087234, AA594766, AA477188, H53631, BE141358, AI298774, BE743169, H03363, H04050, BE141360, BG006416, AI687929, AI270613, AA297403, BE141357, H48473, AA496296, BE259832, T86181, AW188898, AA359247, BE185788, H28080, AI433271, R70772, R23345, H53672, AI500391, H70534, AA374856, AA297085, R33033, R99170, R33920, BE141344, AA852639, AW088943, R81465, AI400220, BE832975, BF359882, AA621048, BF813460.</p>

HETBR16	187	703243	1 - 1555	15 - 1569	AA853069, R81663, AI963710, R23264, BF748942, AA290677, T83919, AA428830, AI687795, BE163435, BE163434, AI289188, AW027045, AA808274, AW074305, AA290975, AA297468, R26089, AA226370, BF000386, AA461006, R23497, AA359017, AW392388, AA258974, BE543413, BF768547, BE702942, T86180, AA291083, H26077, T83747, BE702948, AW058461, BE872231, BE702945, AW749912, BE141374, BF841749, AW016612, BF035814, AW905754, AI953927, AA297469, BC002467.1, AK000261.1. AW661837, AA127395, D62246, BF838051, AA363498, BF673053, BF838050, N68223, AA608520, BF878696, AW238127, AA570224, AI635819, W45298, AW949001, BF932686, BE063025, W45283, BE063030, BF815072, F31654, AI610607, AI640411, AA568947, BE049229, BF856556, AI679442, AI679952, BF857619, AA665645, AV656064, AW949012, AA653612, F27410, AV740009, AI889440, AI540408, AV720211, BF850690, AA605266, BF844769, AW261996, AI885488, AA494090, AA626402, AW020088, AA486970, AW167154, AI809818, AA745356, AI634601, BE162124, AW271917, BE179216, AI859280, AU158549, AW148386, AW971243, BE674880, AA661948, AA665330, AA649148, D82461, F31619, AI565245, AI932902, AA708213, AC072052.6, AL021807.2, AL132718.5, AL132653.22, AP001417.2, AP000160.1, AL122023.3, AL391987.15, AL162385.16, AL390295.10, AP000018.2, AC008122.15, AP001730.1, AL078475.2, AC090051.8, AL132838.4, AL050302.2, AC006026.2, AC004964.2, AC008745.6, AC019274.5, AL163203.2, AC002115.1, AL139809.16, AL139317.5, AL118524.25, AC004098.1, AC006387.3, AL033529.25, AL360219.18, AL163210.2, AC011455.6, Z98048.1, AC007637.9, AL021408.1, AL353679.18, AC021019.5, AC005668.1, AC011497.6, AC010150.3, AL135839.15, AL445490.6, AL033378.12, AF258547.1, AE000658.1, AL133545.10, AL031666.6, AL157829.24, AC020601.10, AC011540.3, AC002350.1, AC007881.4, AC007954.7, AC022407.6, AP001746.1, AB020878.1, AC007055.3, AC003029.2, AL158089.8, AL391384.18, AL352979.4, AC073964.3, AC023668.4, AL356805.5, X87344.1, AL445466.9, AL590043.7, AC083875.1, AC012592.10, AL161938.6, AF258545.2, AF084941.1, AL008723.8, AC011604.10, AC090842.1, AL359238.4, AC018448.16, AC004066.1, AL354707.17, AC068948.1, AL354797.16, AL035671.5, AL050335.32, AC003954.1, AC010620.4, AC021016.4, AC005666.1, AL135927.14, AC007227.3, AC008625.5, AC008521.5, AL022717.1, AC019171.4, AL356782.14, AC003106.1, AL034349.3, AL035587.5, AC007263.4, AC010422.7, AL583856.6, AC004671.1, AC010976.5, AC011471.6, AL162274.17, AC005899.1, AC005406.2, AC023355.5, AC004686.1, AF008243.1, Z94801.1, AL390252.9, AL031734.9, AF015416.1, AL158040.13, AL354993.24, AC005670.1, AL121891.22, AC073838.6, AC005000.2, AC005971.5, AL137230.3, AC009086.5, AL137853.12, AC018828.3, AC006211.1, AC002985.1, AC005209.1, AC022383.3, AL445196.7, AL109946.12, AC011494.2, AC022384.4, AC006500.4, AC008645.4, AC015968.4, AC006353.3, Z85999.1, AC006017.2, AC018832.4,
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HETE28	188	1018676	1 - 1367	15 - 1381	BG119630, BE869422, AW960039, BG178496, BF569042, AI906507, BE292934, BE737354, AA316668, AI573165, AA506280, BF568747, AA041366, AA078820, AW239203, AA078788, AA789197, AA988622, BF360821, AA041314, AI081097, AI144393, BE772522, BE772523, T78909, AW451237, AI383485, AI827415, AW780121, H14188, AA988148, BF055451, AW050735, AI357814, AI927737, AW571807, AA902324, AW191848, BG013614, T78961, BG013615, AW582399, AI860118, AI537605, BE772511, R38722, AI971995, AW603330, AI216108, F07221, AI721103, AA366128, BE772637, AI832342, BE772546, N66739, AW839504, AW628023, AW839460, AA307815, BG011167, BE772664, AA888327, AW166174, AA687993, AW608523, AI221592, AI660617, N99978, BF762467, BE772653, AW365057, W30916, AA877685, BF058671, AI692837, BF762400, T79011, AW367132, BE700349, BE858564, AW882503, AA244424, BF765608, AW469207, AI653176, AA976253, AI160767, AF055009.1, M22406.1.
HETLM70	189	1177512	1 - 1237	15 - 1251	BE645551, BE304956, BE048918, BE740087, AW960605, BE207572, AW195635, AA177001, AI824341, AW362246, BF591120, AA578987, AA425334, BF002699, AI681859, W37110, AA991211, BE859016, AW150693, AW611712, BE179770, BE927270, AI357925, BF038466, AW173702, BF748385, AV724505, AW102565, AW751971, AW748813, BF515478, AA559207, AW601591, AW001725, H13734, AI908541, BF516168, AA426447, BF090860, AA919025, BE830375, AI686245, AA335628, AA160404, AI521130, AA147206, AI689513, AI699743, BE709540, AW751973, AA906975, AA926906, BF855782, BF872555, AW664454, BF765954, BF090962, AC009968, AC009968, AC012314, AC012314.
HFABG18	190	847073	1 - 1331	15 - 1345	BF570393, BF569907, BF344166, AA758023, W63573, AA877107, AW664584, AI924890, BE207784, AI422142, AI811174, AI891097, AI379416, AA631138, AI129321, AA233722, AA861574, AI339443, AW009533, AA635649, AA910314, BF510307, AA948287, AA421401, AA621181, H52254, AA908447, BF127938, AA330666, AA458586, AA328941, AI472877, BF337899, AA853185, R69866, AA852144, BF999691, T49327, AA677036, AW024548, R46515, R69911, BF999694, AW593365, H52351, AA976306, BF903330, T49326, AA233143, AI381786, BE827715, AA359077, AI569251, AI685425, AI826541.
HFABH95	191	566712	1 - 1333	15 - 1347	BF035708, AI431513, AA832175, AI251429, AV729905, AV754716, AI538491, AU122466, AI446474, AC005006.2, AC008747.5, AC008805.7, AL160155.19, AC005081.3, AC013751.6, AC006241.1, AC004216.1, AL137853.12, AC069285.8, AL590762.1, AC004491.1, AL035659.22, AL158040.13, AL022323.7, AL160411.25, AC005231.2, AC005952.1, AC008649.6, AC002059.3, AL355480.22, AC007850.29, AC024163.2, AP000501.1, Z98304.1, AL122035.6, AC008569.6, AL360227.17, AP000694.1, AC005480.3, AC009470.4, AC008392.6, AC011464.5, AC005911.6, AC008440.8, AC013734.4,



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HFAMB72	192	490697	1 - 1309	15 - 1323	AW897798, AL044056, W44681, AV758808, AW057713, AI445728, AI694501, AI567918, BF929670, AW137633, AI362734, AI560113, R66361, AA973346, R24468, AA256199, R24469, M78793, AA987235, R67503, BF926218, AA688372, AA398164, AA861041, AI024099, AA719008, AI694956, AI150346, AI217933, AA459841, BE217862, AA393248, AI652522, AA629029, AW137492, AI075905, AI796754, AF081250.1, AF081249. 1.
HFAMH77	193	543486	1 - 655	15 - 669	AI340312, BE676214, AA778534, AW300884, AI609950, AI340016, AI632085, AI335706, AA768117, AW027671, AW978490, AW590880, AW589742, AI272784, AW027648, AA983621, AI421130, AA918495, AI280887, AA724472, AA830837, AI024114, R60771, AI675916, N94357, BF960835, BF953963, AW572683, AI159997, AW772189, T05324, W52231, AI394585, F35349, AI445605, AI347406, R49581, AW020397, AB051512. 1.
HFCCQ50	194	579993	1 - 1257	15 - 1271	AL522683, AL522684, AI628729, AI133340, AW139771, AI690104, BF195450, AI133381, AW207332, AI267992, AI961337, R41690, AB049586. 1.
HFCDK17	195	381980	1 - 1434	15 - 1448	BF976391, BF976351, BE543824, AI439688, BF792964, AV721546, AW962729, AV694662, BG178961, AA583472, AI057124, AA885710, AA479822, AI653267, AV697510, BE264447, N49701, AI148473, AA081732, AW001515, AI813759, AI922970, N49807, AA731528, BF593785, BF512743, AA479701, AW073331, AW474666, AA452034, AI148815, AI148816, AA702261, AA731291, BE222696, AA445926, AW613459, AA766549, AA044233, AI686965, AI298827, AA939152, AI147270, AA716180, AI024961, AA282006, AA493296, AW152515, AI475562, AI097514, AI039456, AI281632, AI161374, N21383, AA280640, AA888775, AA679522, N62989, AI681386, AA902123, BE966552, AA581408, AA422025, BE221139, AI373682, N33020, AW302611, AI261781, AI364084, AV722450, AI864444, AI885859, H17856, AW673415, AI565955, AA810677, AA426268, AW576089, AA452249, AI763423, BF46873, W37599, H85152, AV724357, T65936, H17857, W81297, W87455, AA425977, AI039721, AA651796, AI355116, AI631378, BE218385, H64238, BG222582, W81298, AW051501, AI002438, AW953685, AA917551, AW050626, N42077, AI264829, N57719, H28947, R15402, BF846414, AI572991, AI446232, T33682, R82258, AA291415, T35180, H28948, M78335, W37503, T15882, AA731627, H61861, R16143, AW953326, T05455, BG030863, BF434064, AA505158, AA281069, AA669379,

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				15 - 933	AL674710, AW075264, A1572441, AW665201, AA975502, AL134012, AL359582. 1.
HFCWEW05	196	561560	1 - 919	15 - 470	AV699250, AV662248, AV699269, AV719565.
HFFAD59	197	520369	1 - 456	15 - 1020	AL537384, A1656961, A1651790, BE466895, AA481913, H54148, AW020416, AA524615, A1309941, T82299, AW971340, A1625683, AA007579, AA670123, AW088680, AA112001, A1250970, A1613405, A1376500, BF526521, AA480105, AA417299, BF054759, BF054867, A1016470, A1373731, AA416675, BE622947, A1340568, BG180542, BE222669, A1266504, A1291507, A1672420, A1650382, BF885229, AA129526, AA081857, AV699196, AV699199, AA948596, AV699131, AV699223, AV662288, AV699219, AV699246, AV662257, AV699269, AV699218, AV662235, AV662248, AV699182, AV699250, AV662242, AV699204, AV699137, AV699147, AV699098, AW963961, AV699123, AV662247, AV662223, AV699144, AV699170, AV699136, AV699224, AV662272, AV699125, AV699203, AV699200, AV699247, AV662191, AV699255, AV662185, AV662196, AV662317, AV662287, AV699236, AV726209, AV652214, AV650926, AV652066, AW956240, L48842, AF051321.1, AF051322.1, AF069681. 1.
HFGAD82	199	513669	1 - 1867	15 - 1881	AL119979, BF346635, AV726399, BF035097, AV727342, AL119977, BF920864, AW888751, N31682, AW148844, AA772781, AA326677, N23200, AW961610, BF976989, BE765872, BE765750, BE765749, BE765443, BF570590, BE765618, BF438771, BE766953, BE766490, F06586, BG057153, R60278, F07047, AA628815, AV722183, R16237, BF364146, AA204942, AV734361, N71200, A1000462, R54067, Z40722, BF337123, R54066, AW903171, H24278, AV726415, H16893, AW897545, H16783, H22887, R16238, F03521, R42035, F05678, T80483, AA321847, AV731162, AV731097, AV730504, AV730299, AV731130, BE763530, R20855, AA386266, AW890775, R45969, R42611, N94832, R39831, F02857, F03323, T03048, R11992, F07675, AU118413, AW890773, AA640468, N95708, F05679, BE830656, BF948144, M85660, AL119687, T08757, AV722325, AW904904, BF344999, A1003266, N76471, N47227, AW903272.

HFIIIN69	200	1011487	1 - 1436	15 - 1450	BF977690, T53097, BF918689, F01937, N58994, AI000789, AW898733, BE702498, BE699153, AL118827, BE708346, F07242, AW897547, F01938, N51309, AC003037.1, AC022486.4, AC007379.2, AC007064.27, AC006548.20, AC016752.2, AC008175.2, AC007965.3, AC007322.4, T66696, T66697.
HFIIIZ70	201	1043350	1 - 1394	15 - 1408	AA448034, AA602540, AA719535, AC018927.6, AC022007.3, AC018809.4, AC007546.5, AC002470.17, AB020872.1, AL035404.20, AL009181.1, AC005102.1, AC007686.5, AC007207.22, AC018808.4, AL109758.2, AL049759.10, AC007308.13, AC002301.1, AC007192.1, AC027797, AC027797.
HFIIIZ70	201	1043350	1 - 1394	15 - 1408	AL048246, BE877406, BE905545, BE440123, BF973568, BG163863, BE878414, AI810399, AA421950, AW954926, AI826072, AA507017, AI597673, AA147367, BE879100, AA586621, AA725205, AI701337, AA595444, AA421951, AA722808, W46280, W70172, AA988274, AA844455, BF869408, W96316, BF834026, BF858296, T59591, BF858292, AI077904, AA587061, AA058506, BF858302, AA147419, AA649904, AA651755, AW579978, AW383857, AI734990, AI077596, BF858301, AA034247, R24354, AA576389, AA054465, AA814555, BG170925, W69907, AI918084, BE833571, BE159104, W96221, AA326962, BF339936, AA319027, AL048247, AA626906, AA897619, AI826118, AA683597, BF363870, AA932608, AA046341, W32814, BF858297, R24251, AA046263, AA630968, AW750463, AI146631, AI270350, AI074824, AI074849, AI081420, AI086654, AI954162, AW029263, AI675825, BE964767, AI886181, AI799183, AI620302, AW268243, AI634450, AI334450, BE968711, AI540458, BG251257, AI699011, AW268220, F27788, BE733009, AI336575, AW129271, BE964497, BG025209, AI345148, BF817418, BF344652, AI627896, AA983883, BF816455, H42825, BE967255, BF343172, AI812080, BF055742, AI613548, BF814360, AI336494, BE963918, AI452993, AI520931, AI345229, AW302854, AI349798, BF924856, AW168485, AI699862, AI073952, AI349004, AW152469, AW149925, AA494167, BE897632, AI335209, AW961463, AI859464, BG254754, AW271119, F37450, AI687166, AI784230, AW403717, BF987104, AW172723, AI891157, AI480118, AI805638, AI933589, AI811644, AW303089, AI680457, AI783861, AI434741, AW083804, AI251830, AI828731, AI924971, AW268306, AI612759, AI648663, AW022682, AI566630, BE393551, AI537617, BF812963, BF817402, AL119319, BF870154, BF921092, AI499285, BE613727, BE965724, AI446248, AV716516, AL038605, AI680162, AI475408, AI682841, AI568114, AW193872, AI537024, AI866465, AW193843, BF970449, BF032768, BF812938, AI567351, BF764538, BE966990, AI538342, AI620003, BE544111, BF895953, AI610645, BG112239, AI432040, AI866127, AI568138, AI445992, AI922550, AW162189, BG027628, AA493923, AI927755, AW079159, AW117746, AI244380, AI539711, AI866573, BF909758, AV682124, AI567582, BE966388, AI580984, BF854113, AI554343, AI619587, BE964576, AI857797, AW117919, AI922561, AI249877, AI344785, AI783504, AL036214, AI699255, AW163823, AI677824, AI874166, AI698401, AI932949, AI564528, BF915208, AI142101, AI539028, AI866741, AI367210, BF814335, BG120816, BE536058, AI867042,

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HFKET18	202	889515	1 - 2393	15 - 2407	BG110420, BG115334, AI185642, AW611548, AI765744, AI049960, BF206049, AI884824, AI760384, AA603803, AI990152, AI991071, BF512789, BF111782, AI653741, AA425329, AW411097, AI934872, W87427, W38311, N46445, N81109, AI061327, AI500218, AI365116, AW235906, AA426444, AW590032, AA922999, AI675005, BE538807, DI9613, W67792, AA515114, W67850, N79808, AA903300, BF310800, AI365322, AW675761, AA806029, AA856723, AI049728, AI653583, AA911610, R21297, AI040049, AI889471, AI368191, F08500, BE730105, AW196227, AI890737, BG258747, BE220526, Z39142, N70816, AA749162, AA258815, AA665599, T79989, AI193425, AI970238, BE781345, AI216679, F04714, W01450, AA349299, BE252937, AI696235, AI915010, R46143, AW937426, AA761144, N48946, Z43036, AA912452, BE177220, AW613925, BE543843, BF307683, AI472495, AI954525, BF821897, BF821009, AA937427, N64587, AF055012.1, AL050318.13, AB042646.1, DI6966.1, AC005157.1, AL080249.26, AL136313.27, AC002492.1, AL139415.10, AC020947.6, AC005412.6, AL109823.23, AL035413.19, AL021391.2, AC011742.3, AP002851.2, AC016601.6, AC007731.14, AL158040.13, AC010654.8, AC007272.3, AP001712.1, AL389888.8, AC007226.3, AC010326.6, UI7296.1, AP001717.1, AL033529.25, Z93930.10, AL353812.13, AL356915.19, AL391827.18, AC004087.1, AC025593.5, AC007052.4, AC006285.11, AL118520.26, AC005500.2, AC011467.7, AL132777.4, AC005180.2, AL121601.13, Z99716.4, AC018644.6, AL022165.1, AP001745.1, AC002115.1, AL133545.10, AC009412.6, AL121751.12, AL136123.19, AC006965.3, AL121747.41, AC005052.2, AC005899.1, AF219991.1, AC010463.6, AC004089.25, AL356299.16, AL365505.15, AC006312.8, AC024563.4, AP001670.1, AC005971.5, AC013717.8, AC005081.3, AL121972.17, AC007934.7, AC007055.3, AC011737.10, AC006241.1, AL035415.22, AC005722.1, AL049780.4, AC044797.5, AL137792.11, AL359091.10, AL138836.15, AC004000.1, AC007237.3, AC008925.3, AL033392.5, AP001621.1, AC006211.1, AC018758.2, AP001693.1, AC005015.2, AL133485.3, AC007199.1, AC006084.1, AC011544.6, AP001716.1, AC008569.6, AL034420.16, AL049776.3, AC009004.6, AL049867.2, AP003357.2, AC012476.8, AF134726.1, AP001727.1, AC005098.2, AC008755.6, AL121653.2, AC006511.5, AC011475.6.
HFLNB64	203	580829	1 - 634	15 - 648	AL079416, AI654075, AW629118, BF794456, AW025530, BF055088, N66446, BE219553, BE674058, BF438639, W68255, AI333021, AA720596, BE504298, AA059169, W68256, AI675586, AW102669, AI086268, AA534003, AW973227, Z38810, BE887766, AW136936, AW409032, AA059076, BF699477, BE698236, AF131216.1, AL080178.1, AF124367.1.

HFOXA73	204	850699	1 - 526	15 - 540	AC005866.3, AC007618, AC005866.
HFOXB13	205	570699	1 - 1155	15 - 1169	BF592863, AW594700, AC090945.1, AC009508.3, AL390068.12, AP001422.1, AP000021.2, AP000162.1, AP001731.1, AC079950.23, AC005670.1, AL138690.19, AC010163.7.
HFPAC12	206	589522	1 - 1074	15 - 1088	AL520282, AL804338, BF951545, AW206420, AL039803, AL362891, BE699734, AA410892, M79026, AA419536, H47046, AA082306, AL520649, BF951672, BF944123, AW904559, BE702538, BF944119, AW954591, BE935929, Z45619, T79873, AB023185.1.
HFPAC071	207	629193	1 - 2053	15 - 2067	AU119532, AW976010, AV762220, BF792326, AV760760, BG164166, AL037632, AU117926, AL135377, BG034591, BE538259, AV714931, BE541237, AV760723, AW188427, AV759172, AW965008, AU147226, AW833144, AU148007, AA526787, AA836811, AL138254, AW069819, AW955841, BE566072, AV760360, AV762022, AV759356, AV760364, AV759683, AW151713, AW576384, BG118507, AW440545, AV762001, AA527963, AW248523, BF381650, AV762779, AA782322, AW968205, AV759711, AV762900, AW406162, AV759682, AV762902, BF769434, AA727125.4, AC027129.5, AC090883.1, AF229123.1, AC011510.7, AL034549.19, AC002301.1, AC055120.5, AC006065.3, AC002115.1, AC010530.7, AC011464.5, AL135928.6, AL031680.20, AL137918.4, AC005899.1, AC005300.10, AL138743.5, AC007421.12, AC009220.10, AC006994.4, AC004890.2, AC005778.1, AC006483.3, AL022328.21, Z93023.1, AC005682.2, AC009144.5, AC007536.9, AC005696.1, AL034405.16, AC005520.2, AL139317.5, AC039057.8, Z93015.9, AL021397.1, AC011890.4, AC008267.6, AC004477.1, AC011471.6, AL009181.1, AC009087.4, AL139095.15, U95742.1, AC006064.9, AC001228.1, AC010378.6, AC004230.1, AC016772.8, AL136300.22, AL121886.22, AC006312.8, AL034402.9, Z84480.1, AL512430.14, AC025430.5, AL13246.2, AC007690.11, AC090939.1, AL445222.9, AC005324.1, AL109965.34, AC007688.15, AC004975.2, AC005512.1, AC008543.7, AC058791.3, AC004805.1, AC004841.2, AC004814.2, AL121655.1, AL360230.20, AC018758.2, AC007041.3, AC005052.2, AL096791.12, AL163279.2, AC002350.1, AC007308.13, AC005086.2, AL160175.5, AC004876.2, AL050349.27, AL359092.14, AC008264.10, AC010553.6, AL157877.11, AC005484.2, AC011475.6, AL161670.4, AC003029.2, AC019205.4, AL031311.1, AC007225.2, AC005920.1, AC010276.6, AL109805.14, AC011470.5, AC011462.4, AP001751.1, AL049709.18, AC011461.4, AC013467.8, Z93930.10, AC022415.5, AL035704.9, AL512641.9, AL023803.3, AL121753.30, AC005519.3, AC010469.7, AC072052.6, AC005081.3, AC008622.5, AC006449.19, AJ009612.5, AC011500.7, AC025280.4, AC034193.4, AC010326.6, AC074142.3, AC012450.9, AL024507.7, AC002563.1, AC024568.4, AC018636.4, AE006639.1, AC005822.1, AC005828.1, AP001760.1, AC005722.1, AL031427.15, AL049872.3, AC005755.1, AC005911.6, AL137139.9, AL160411.25, AL031281.6, Z83844.5, AL049760.26, AC007435.12, AL133448.4, AC023344.4, AL121658.2, AC011487.5, AC004408.1, AL121928.13, AC006452.4, AC003982.1, AC002418.1.

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HFPCX09	208	1309793	1 - 2199	15 - 2213	AL536594, AV721181, AL138260, AW182261, AW590515, AL621238, AA992136, A1039940, A1240096, BF475263, A1989349, AA992473, T15408, A1918747, H05529, H46336, R44821, R45685, H12939, AA296979, H05383, H05384, C14158, A1802297, D45285, R14994, H10614, H46267, AF055636.1, AL157396.9.
HFPCX36	209	526635	1 - 782	15 - 796	AI085242, AI440117, BG012020, AA659232, AA131088, AC006160.9, AC006449.19, AC020904.6, AC018711.4, L44140.1, AP001760.1, AC004983.2, AC005529.7, AL135744.4, AC005527.3, AC083868.2, AC051619.7, U91323.1, AC008623.4, AC023510.16, AP001718.1, AC020916.7, AC018801.4, AL049776.3, AC006006.2, AL355343.18, AC067941.7, AC011731.8, AL356805.5, AP000501.1, AL139021.6, AC018828.3, AC006205.7, AE006467.1, AC007263.4, AL121658.2, AC005409.1, AC022415.5, AL121983.13, AC005089.2, AC020983.7, AC004491.1, AP001830.4, AL162615.13, AC009412.6, AL049709.18, AC018808.4, AL138741.13, AC022443.4.
HFPCX64	210	1309796	1 - 1062	15 - 1076	AW972136, AW969544, AA503871, A1272041, AW515225, H65747, BF935424, AC016025.12, AC016026.13, AC007845.12, AC005562.1, AF165926.2, AC020904.6, AC020917.4, AL162615.13, AC005077.5, AL121655.1.
HFRAN90	211	520368	1 - 518	15 - 532	AV705871, AV702196, AW965899, AW950678, AW959842, AV727499, AV705836, AV709248, AV728351, AV705453, AV728953, AV727766, AW963219, AV705697, AW956780, AW958316, AV726243, AW958045, AW956792, AV703742, AV726617, AV727120, AW956797, AV727144, AV705340, AV721818, AW964578, AV708025, AV705221, AV685113, AV707804, AW963399, A1536138, A1535660, AW966491, A1557799, AV725783, AV655703, AA585430, AV701667,

					<p>AV746191, AW957853, AV728973, AW963378, AW959956, AV661824, AV741949, AV753624, AV726270, AW950597, AV701071, AW962407, AV727361, AV738232, AW951204, AV726551, AV731131, AV726328, AW961409, AV724091, AV707353, AW953763, AV729557, Z28355, AI547039, AW950644, AW954994, AW963350, AW965898, AI170832, AV702345, AV727828, AW955629, AV729198, AW964540, AV707331, D61254, AW963631, AV688541, AV702601, AV703620, AV712504, AW952064, AV717687, AV715667, AW955719, AV728210, AW954141, AW961831, AV692516, AV702095, AV705319, AW957300, AW959059, AW958033, AV762741, D60765, AV651281, AV745417, R45895, AV727449, AV732203, AV732299, AV730062, AW950971, AW950004, AV730119, AV730216, AW949940, AV707733, AV730546, AV730062, AV730115, AV731078, AV732566, AV702146, AV730609, AV701283, R28735, R29445, AV752043, AV731977, AV725497, AV730781, AV731694, AV731043, AV730288, AV732002, AV723449, AV723273, AV732149, AV732155, AV732255, AV752443, AV701626, AI557264, AW961578, AV729378, AW962864, AW957318, AW950689, AW955905, AV684604, AW965730, AV709733, AV728818, AV699199, AW965749, AW967047, AV699182, AV699139, AW950531, AW952395, AV701183, AV728312, AV704490, AV728884, T18597, AV709555, AV727954, AV729076, AV701088, AV703972, AV731411, AV649758, AV658784, AV705185, AV702191, AV729348, AV728642, AV705548, AW949437, AV658448, AW961112, AV723874, AV730165, AV725432, AV701311, AV728062, AV725568, AV729568, AV742757, AW964072, AV742025, AW966165, AV699136, AV662287, AV699123, AW949934, AV699125, AV699200, AV753956, AW949351, AV727490, AV699247, AV651519, AV699137, AV707020, AV707556, AV701320, AV704059, AV703213, AV701059, AV705710, AV731348, AV706318, AV725274, AV727152, AW958519, AW949390, AW952896, AW963011, AW949529, AW949327, AW951728, AW953804, AW961841, AV708717, AW958860, AW962978, AL359839.4, AC005087.2, AJ244005.1, D50010.1, AJ244004.1, D78345.1, AF144029.1, AJ244006.1, S81957.1.</p> <p>AL529436, BG254023, AA069656, AW512689, AA928735, BE901109, AL529437, BE074967, BE074973, AA423996, AI027673, AI130940, AA827360, AA424006, AA421599, AW602733, AI580837, AL526924, AA114876, AA576953, AI858981, BF222157, AL526960, BF542049, AA136831, AI200715, AI358322, AA988755, AW602739, AA187921, AL527090, H10340, AI499041, H10044, AA252300, AA188494, AA856927, R44331, AA588683, AW364266, BE092940, BE007334, R51006, AI253378, AA481649, AI686745, AI628242, BE092920, BF733881, AA729977, BF026424, AW804569, AA421594, AW994967, AA481416, BE733257, BF876214, AA679567, AW028221, AU134538, BE251492, BE729280, AI906091, BC002480.1, AK023414.1, AP002347.3.</p>
HFTBM50	212	545012	1 - 748	15 - 762	
HFTDL56	213	695976	1 - 1825	15 - 1839	
HFVAB79	214	1300736	1 - 1161	15 - 1175	



HFXAM76	215	601402	1 - 933	15 - 947	AV699170, AV699125, AV699144, AV699136, AV662257, AW952432, AV662242, AV650031, AV662196, AV719825, AV719156, AV720062, AV720893, AV724349, AV699246, AV699147, AV724520, AV699197, AV699218, AV699247, AV662167, AV699119, AV699199, AV662268, AV662225, AV662149.
HFXDJ75	216	626114	1 - 1904	15 - 1918	AV652810, AV699123, AW963961, AV662272, AV699182, AV699246, AV699223, AV699147, AV645788, AV699204.
HFXDN63	217	553685	1 - 1012	15 - 1026	AV699204, AV699196, AV699199, AV725496, AW952432, AV652809, AW958904, AV662223, AV699218, AV719825, AV719156, AV720062, AV720893, AV648653.
HFXGT26	218	745381	1 - 1743	15 - 1757	BE736918, BE250577, BE616582, BE728115, BE615376, BE563291, BF793477, BG250960, BE386373, BF338817, BE531051, BF680445, BE385152, AU139668, BE883545, BG032917, AU120778, BF943073, BE899007, AW899342, BF803637, AV701925, AV706319, AU136531, AW957880, AW957801, AA307661, BF882363, BF217767, AA121877, AV732690, BF218444, BF203663, BE264980, BF957961, AJ380547, AA134410, BF207674, BE061899, AA826146, AL133895, AA505043, BF733347, BF384186, AV730296, BE184422, H02956, AA583368, BE154390, AV742189, AA180023, AW276742, H92806, BF773043, BF815608, BF957954, AU116940, AA243106, BE304382, BF962070, BF811794, AA227286, AA715194, AA969742, AI003034, AA221018, T60641, BF592342, AA179694, AV749263, BE565499, BE566249, AA584467, AA504672, BE736970, AI918674, T07838, BE792178, BF197329, AW630075, H47099, AW515786, BE968449, H78916, AW865469, BF951636, AA317928, AA503299, AW963317, AA782913, AI440300, AW899603, H67930, BF238662, AW899527, H63688, AW962826, AL134062, AA359714, H71269, AV750972, AA356190, AA572768, T92166, T60713, AA491404, AA431655, T57502, AV683302, AV698434, BF929662, H71280, BF767788, BE617381, T62188, AW898213, AV715734, AW865403, AW872342, AV682563, AW898920, AI088102, BF812273, AA173218, AW023095, BF920075, BE898175, AA984544, BF759180, AAG01152, AV697443, H53927, R01106, BF873657, R24107, AA225638, BF911201, AA657747, T97032, T98711, AA774178, BE220229, AA081887, AA312997, AW864780, AI557831, AI142016, AA577789, BE884391, H67786, BF857863, W22010, BE165736, AU127460, N41805, AW855025, AW999271, AA281292, AA133041, AA083246, AA568139, AV731015, BF829537, BF874267, AA232145, BE564886, AA418919, AV731611, T97044, BF871285, AI940708, BF763808, AW997042, AL118813, AA353087, T59997, AA434462, BF869361, AW845664, AA833581, T94924, AW845678, AA431294, BE010787, AW845665, AV731929, AA614154, T57455, T63143, BF877837, BF869076, AV729748, AV691164, BE568189, W22978, BF212724, BF002494, BF675027, T70833, AW962273, AA136772, AC018641.3, AC006500.4, AC013470.10, AC005248.1, AL133321.11, AC084356.22, AC013357.19, AL161797.10, AC010745.4, AL133391.5, AC022415.5, AC008770.6, AL049555.6, AC015723.8, AL135796.6, AC016749.4, AL139109.14, AC066584.6, AC004711.1, AC011503.4, AP000827.4, AL358975.8, AC022325.5, AL049828.3, AL096862.18, AC007128.2, AL354942.10.

AL391152.3, AC006027.1, AL109659.20, AC073964.3, AP002022.1, AL157367.15, AL022578.1, AL163268.2, AF051934.2, AC016748.3, Z92844.1, AC018645.4, AL139232.13, AL031655.8, AL157775.15, AC007320.3, AC007023.3, AL359712.12, AL445590.4, AL022171.1, AC007221.2, AC015983.7, Z98046.1, AL161757.4, AL138961.17, AC003086.1, AL158153.10, AL354825.10, AC010148.13, AC019050.4, AC090954.1, AC024581.3, AL132985.4, AC010176.12, AC013751.6, AC007558.3, AC010634.5, AF279660.2, AL450169.1, AL031768.9, AL133153.3, AC008898.6, AC006355.3, AC012591.8, AC022443.4, AL022726.1, AL136441.16, AL136307.12, AL391478.14, AL139340.12, AL353741.16, AC007132.3, AC023795.18, AC073221.8, AC068323.8, AL139014.6, AC006203.1, AL162385.16, AL158093.8, AC006596.2, AC006385.3, AL357312.8, AFI98097.1, AP001955.2, AC019155.4, AC010305.3, AL512428.13, AL078623.28, AL513264.8, AL163639.3, AL357092.4, AL161730.9, AC060232.5, AC004592.1, AL137000.6, AC002080.1, AC010143.3, AP001718.1, AP000194.1, AP000314.1, AL021877.1, AC002980.1, AC021017.4, AC006206.3, AC004053.1, AC025575.21, AL365367.10, AL445332.8, AL513128.11, AL356317.8, AL360020.15, AC008488.7, AL354802.15, AC004388.1, AL389889.11, AL355074.5, AC010722.2, AL513011.7, AL450345.6, AC016910.5, AP000742.4, AC004216.1, AC011594.8, AL360236.26, AC010585.6, AP000811.4, AB038490.1, AL158070.11, AC073308.4, AC020647.9, Z82195.1, AC002038.1, AC016711.9, AC007043.3, AL158206.8, AL022399.2, AC009301.3, AC006984.2, AC004000.1, AL356438.15, AC005344.1, AC008945.6, AC007313.3, AC000060.1, Z73986.1, AC027287.20, AL356601.14, AF280107.1, AC004056.1, AL109933.25, AC008551.5, AC009949.9, AJ277546.2, AC018741.3, AL162431.17, AC020644.6, AC069294.5, AC004694.1, AL157398.6, AC005798.10, AL118496.21, AFI49774.1, AL358293.4, AC010104.3, Z98754.1, AC006002.1, AL118519.25, AC015522.6, AC018677.3, AC019041.8, AC073323.5, AC009623.6, AC018698.5, AC010348.4, AL590788.8, AL445932.12, AC009517.5, Z83745.1, AC002066.1, AC005019.1, AL117375.12, AL096817.12, AC006257.1, AP001376.4, AC069285.8, AC006362.2, AL137145.13, AP001818.2, AL359502.14, AP002768.3, AFI72277.1, AC008550.4, AC008277.4, AC007538.5, AL138694.18, AC005024.2, AP000647.4, AC005690.8, AC076972.16, AC010338.6, AL359755.9, AL121595.5, AL442646.14, AL117337.25, AC012492.9, AL590964.8, AC006568.7, AL391260.13, AP001002.4, AL031586.2, AL079307.7, AF225898.1, AC084783.2, AC005172.1, AC009779.18, AL356378.17, AC006479.2, AL08722.16, AC003977.1, AC005392.1, AC018360.16, AL391065.6, AC009264.6, AC009332.6, AL133319.24, AL353573.10, AL355834.4, AC008943.6, AC074391.5, AC012442.7, AC024084.4, AP003467.2, AL096706.10, AL049792.11, AC006478.2, AC063956.7, AC046130.25, AL096704.8, AC021269.4, AL391867.5, AL353613.10, AC006371.2, AC009514.2.					
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HFXGV31 HFXHD88	219	526253	1 - 738	15 - 752	15 - 1602	AW002350, AV764465, BE158716, BF876961, AA724333, BE973589, AA812141, AW473455, T06754, AU159337, AA297769, AC005095.2, AL121869.19, AC007919.18, AC003954.1, AL161420.10, AL513264.8, AL035405.10, AC005038.5, AC016749.4, AC005548.1, AL031118.21, AC002553.1, AC004477.1, AL133545.10, AC008041.5, AC011422.2, AL353633.13, AC012005.4, AC005627.2, AL135841.11, AC027319.5, D14813.1, AC009137.6, AC034240.4, AC005884.1, AC034193.4, AL031848.11, AC009412.6, AC008125.9, AC018808.4.
	220	589523	1 - 1588			
HFXJU68 HFXKJ03 HFXKY27	221	1352218	1 - 698	15 - 712	15 - 941	AU132593, AA102019, AW842825, AB046799.1, AK001632.1.
	222	505207	1 - 927			
	223	634161	1 - 931	15 - 945		AI041718, AC006213.1, AC035150.1. AA483223, AA52843, AV762050, BF991286, AA623002, BF827410, AW193265, AI434706, AV759204, BE350475, AI270117, AV760937, BF217299, AV710066, AA610493, AI350211, AL041690, BF475381, AV764241, AV764307, AW673241, AV762139, AI192631, AA552856, AV763540, BF676536, AA468131, AV682003, AI368256, AI345157, AA649705, AI345518, AV760774, AA480772, AA521323, AI538433, AA644538, AL037683, AA577906, AA613227, AA503475, AW270382, AI355206, AW021583, AV759274, AA521399, AV761155, AA492166, AV735495, AI431303, AA490183, AW088846, AF330238, AA857486, AA493621, AV759382, AW438643, AA579362, AI610159, AA525790, AA507824, AV742057, AV763255, W60061, AV761786, AA644551, AI254615, AV735370, AW872676, AA649642, AA652057, AA984708, AA579736, AA682912, AA525824, AW238583, AW977303, AA470969, AI963720, AV734666, AV760624, AV762826, AA970213, AA908422, AI613280, BG150790, AV760777, AA834755, AW513362, BF668217, AA657535, AV761925, AA357937, AV730301, AV763971, AA491831, AI688846, AW731867, BE502107, AW517737, AV762558, AW238542, AA766151, AA862173, AA350859, AI619997, AA501418, AV702857, AA601355, AI634384, AF001552.1, AL354749.6, AL122015.17, AL163032.3, AF279660.2, AL034405.16, AL035699.4, AL365315.8, AC010269.5, AL022163.1, AL031661.28, AC090497.2, AC005084.1, D83989.1, X55926.1, X54181.1, U57007.1, X54178.1, U18391.1, U18392.1, U57006.1, U18394.1, X55925.1, U57005.1, X54179.1, X75335.1, X55932.1, AC020728.4, U18390.1, AC004887.2, M37551.1, X54175.1, U57009.1, U18395.1, AC006511.5, U18393.1, X54176.1, U57008.1, AC005521.1, AL135903.12, AC004662.1, AL158052.10, AC004525.1, X55923.1, AL136090.12, AL157955.5, Z22650.1, X54177.1, AL13332.12, AP001677.1, U18400.1, AC009481.4, U18396.1, AL121891.22, U18399.1, U57004.1, AP001696.1, AC002529.1, AC009950.6, AC005740.1, AL049745.9, AC006287.1, AC009498.3, AC034305.6, AC008168.3, AC004972.2, AC011938.4, AL031275.1, AC008962.8, AL139350.17, AL590621.10, AL050325.20, AC005913.2, AC010748.5, AL109755.14, AL157830.10, AC002303.1, AC009508.3, L47228.1, Z77249.1, AP000501.1, AC073138.3, AC006376.2, AC010482.7, AL049563.4, X55927.1, U18398.1, AC005274.1, U18387.1, AL139082.18,

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HGBFO79	224	422794	1 - 1524	15 - 1538	AL529939, AL529940, AL528803, BE735106, BE798231, BE745759, BF312738, BE877016, BF343676, BE727149, BE549483, BE902824, BE905952, AL045805, BF310548, BE735699, BG259719, BE909739, BG030614, AW151250, BE382644, BE293088, BE907275, BE902845, BE390391, BE617060, BE886529, BE888201, BF313296, BE897351, BG253429, BE515066, AW732704, BF791531, BE409147, AA402631, AV708863, AA502644, AA724973, AA057574, AW957597, AV702553, BF973113, BG180500, AV702396, BE742746, A755278, AA290638, BE903995, A1089475, AA887805, A1161001, BE392156, A1342640, BF245183, BF820884, AL079399, AA993506, BG105105, BE019281, AV723744, C06428, A1310732, BE904398, BE378151, AA676716, BF980925, AA402669, AA58203, W46517, BF155847, AA324688, BE794205, AA682577, A1086193, AA350920, AA410238, AA436330, AA430533, AW863222, AA477605, AA355049, W52276, BF972686, R98071, BE741396, AA430492, A1659749, BF089390, F31374, BF984040, BE909563, BF357217, BF357202, H54089, R84453, BE794934, R54514, BF357191, BF357182, BE544952, BE091550, AA329392, AA203205, W88866, BE799599, F05766, AL528802, R76898, A1828302, A1909292, R79667, U46298, U46408, A1783909, AA290651, BG027789, AA325152, R77063, AA419293, AA284571, W03246, AA433853, BE379015, AA344489, BF812320, BF993643, A1207133, T74861, AA477478, BF083007, AA776079.

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HHAAAF20	228	838603	1 - 1481	15 - 1495	BE562242, BE782638, BE542785, BE871376, AW962260, AW118853, BG163298, AU151024, AW956135, BG254474, AI014552, AU153853, AI128005, AI304951, AU151709, AU123132, AI806634, AI554797, AA864943, AU151959, AW956137, AW731743, AI023423, BG150021, AI859224, AA001739, BF725954, NS1229, BF476487, AI206406, AI422749, AI888568, AW511373, AW966806, BF110112, AA776417, AW192477, BG027748, AI161044, BF913352, AI306577, AA878001, W37987, AA587858, AW072232, AW451522, T57196, W37988, AA477029, T94775, AA022682, N24284, N32175, BE696738, BE857520, AI022374, AA527439, AA282898, AI538443, BE703950, AI208820, T55949, AA022801, W79912, W02715, BE041622, AI420754, AA911458, AA813028, H80241, W78127, BE221072, AU156435, AA884339, AA309975, AI276411, W03712, AA321763, W27545, BF887745, AA548566, AA339184, W25734, T94024, AA370906, AA001808, AW020249, H56404, BF926153, AI499535, AI869412, R22900, AI828446, BE241440, BE243664, AJ293456, AI146581, R23002, H56188, AI824776, AA321910, M85881, C01054, AA872708, BG166236, BF942843, BE541266, BE158250, AA971014, AI243389, BC000978.2, AK022524.1, L39210.1, AK000266.1, L33842.1, AK025013. 1.
HHHEAA08	229	638231	1 - 2136	15 - 2150	AL520596, AI370425, BE567612, AI343143, AI016704, BF678494, AI284640, AI952900, AI038606, AW302048, AI049996, AW500125, AA318267, BE139267, AW979140, AA484143, AV763401, AW021774, AI345123, AW302315, AI754661, BF725347, AV762129, AI039187, AI079734, AI344810, AV763657, BE676900, BE139358, AL045077, AI192278, AW069227, AV710066, AV758989, AL526288, AA528480, AW303196, AW088125, AI270117, AA491814, AW301350, AA448838, AI538812, AL041706, AI918013, AV682003, AI754291, AU154948, AV760937, AW419262, AV728928, AW833862, AW731867, AW238016, BG031290, AI696793, AA524832, AA601680, BF926429, BF916934, AI473701, F32710, N91310, AA730635, AI634187, AW193265, AW504224, BG033217, AA167055, N22032, AV755512, AL046409, AC016601.6, AI121988.10, AC010219.4, AF235097.1, AL035450.1, AL132986.4, AL133260.12, AC004000.1, AC005291.1, AL031431.8, AC009087.4, AF130343.1, AL138880.14, AC007036.3, AL132987.4, AL031719.12, M69197.1, AE006467.1, Z85996.1, AC012076.4, AL035400.13, AC007564.9, AC006206.3, AL449212.1, AL158830.17, AL356378.17, AL049569.13, AL031584.1, L78810.1, AL121845.20, AC007566.2, AC011465.4, AC005540.4, AC025572.13, AP001713.1, AC002352.1, AC007193.1, AL139092.12.



					AF001549.1, AL121865.7, AC010458.5, AL121895.26, AL133415.12, AL121657.2, AL389921.12, AP000100.1, AL031727.42, AL161747.5, AC008395.6, AL353140.12, AC073593.13, AL157828.14, AL157398.6, AC079141.7, AC006952.6, AL034431.16, AC078962.30, AC008882.6, AC009228.4, AP001694.1, AL121899.37, AC005697.1, AL160273.9, AL031291.3, AC008745.6, AL137859.3, AL161896.16, AC007055.3, AL121910.26, AL117328.5, AL450169.1, AC005768.17, AP000208.1, AP000130.1, AC005071.2, D83989.1, AP002008.5, AP000247.1, AL353613.10, U95740.1, AC002045.1, AC006057.5, AC009314.4, AC008747.5, AF279660.2, AC004231.1, AC078961.23, AP001725.1, AL035089.21, AP003357.2, AJ003147.1, AL359739.8, AL352984.4, M55538.2, AC005304.1, AC079045.2, AC004522.1, AF241728.1, AC007221.2, AL161937.13, Z82097.1, AF069291.1, AL110114.1, AC008482.5, AL109615.41, AL391122.9, AC018618.5, AL161421.11, AL049869.6, AC010489.4, AC005007.1, AC083870.2, AC006285.11, AL158035.14, AC007198.6, AC078876.15, AF243527.1, AL391280.15, AL031681.16, AC016025.12, AL160410.24, AL138762.20, U93305.1, AL031985.10, AL121754.18, AC008394.3, AC007161.1, AL590732.7, AC022212.4, AP002851.2, AL356321.9, AL008708.4, AL359846.11, AC006270.1, AL050349.27, AL445483.13, AC005325.1, AL353748.13, AC009955.4, AC002381.1, AL122004.17, AC009230.3, AL049776.3, AP001710.1, AC008547.5, AC008555.5, AC005520.2, AC002565.1, AL031176.8, AL138741.13, AC005678.1, AC004590.1, AL133551.13, AC009238.4, AC007673.7, AC008872.5, AJ289880.1, AL096793.20, Z85987.13, U57009.1, AC004890.2, AC005822.1, AL590762.1, AL160237.4, AL391684.6, U91326.1, AC083875.1, U96629.1, AP000426.3, AC013429.12, Z98051.6, AL031055.1, AL049758.11, AC004826.3, AL355096.4, AC009309.4, AP001830.4, AC008755.6, AC007749.3, AC005887.3, AC002395.1, AC002418.1, AC010504.7, AL161627.13, AL118511.25, AL139317.5, AL442203.12, AC004386.1, AP001972.4, AC016830.5, AC004832.3, AP001614.1, AC004846.2, AL035685.21, AC005701.1, AL132713.11, AC007465.4, AC005669.1, AL352976.3, AF134726.1, AC006052.5, AL133328.13, AC079684.16, AC011739.7, AC016027.15, AL359851.19, AC078958.30, AC022173.7, AC011359.5, AC006026.2, U57007.1, AL139100.9, AL445675.9, AL445258.4, AC009470.4, AL133324.13, Z82194.1, U18391.1, AC002316.1, U18394.1, AL356801.5, X54176.1, AP001781.4, AL135907.21, AL353734.12, AL031963.40, AL133338.8, AL135744.4, AL121601.13, AL359813.23, AP000036.1, AC009464.7, AC004812.1, AC018710.4, AL160192.3, AC026463.4, AL109825.23, AL121902.13, AC019041.8, AC079602.15.
			1 - 1813	15 - 1827	AL524174, AI127452, BE896201, AL524173, AL659805, BE669459, AA772145, BE673752, AV705458, AW340996, BE669965, BE550192, BE222932, BF447637, BE502988, AI703194, AW351965, BE503997, BE705839, BE255753, AW351958, AW351966, AW772606, AW351967, AW136469, AW177978, AI769135, AI813938, BE221299, BE537723, BE892072, BE705836,
HHEBB10	230	604124			

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HHEMA59	231	823100	1 - 3088	15 - 3102	<p>AV726528, BF574791, BF996057, BF990910, BF035428, BF695329, AI096792, AW977965, AA811457, AI742527, AI820061, AI921596, AI984225, AW961815, AI393746, AI573202, BF970504, AI245917, BE670178, AI283174, AW043715, W74699, AI174605, AA810908, AI367927, AI285046, BG117412, BF338708, AI357298, AA215462, BF810183, BE927671, AI334340, D62083, T32812, N70003, W74737, BE927668, BE568242, AA463313, AI880873, AI039073, AA862480, D61879, AA130296, H70799, AA215463, Z45087, T60267, R76519, AL157633, AI264491, T32813, R81074, AW089194, BF088910, R80967, H70800, N62108, R76520, BF356673, BE940685, AW900254, AI885935, AI370183, BF925069, N78339, H60031, BE935677, T61647, AL136527.9, AB014529.1, AF176555.1.</p>

HHEMA75	232	494099	1 - 851	15 - 865	AA464839, BE269516, AW470830, AJ808512, BE907567, BF381742, AW044532, W20358, AA780196, BE894120, AA450310, BG115487, BE767266, AW504536, AA243525, BF248139, A1218646, AJ358214, AC008154.6, AC018646.3, AK027726.1.
HHEMM7 4	233	941955	1 - 2598	15 - 2612	AI912020, AJ738591, AI530623, BF000400, AI673200, AW195629, BF590333, BE465055, BF342074, AW207103, AJ914327, AJ016102, AI948562, AA515654, AI858984, AI021976, AA824295, AW003109, BG106995, AI288261, AI332790, AW873004, AA447206, AI863407, AW271426, BF222197, AI673222, AW274813, AI093417, AW197033, AA846300, AI989749, AA917651, AJ933079, AI198249, AA149282, AW337461, AA029228, AI20416, N89854, AA476264, AI650694, AV760466, AA805734, ZZ8929, AV762395, AL042753, AI862408, AW137892, AW250017, AV759518, BE744242, AL138455, AV762645, AW582878, H43959, AI679782, AA029227, AL043009, BF337291, AA078301, AV682003, AV763971, AV720371, AI400383, AL042853, AI138265, AI971136, BG116267, BG116323, BE874842, AL043718, AV733824, AL079812, AI284640, AW954829, AI133164, AF039185, BG249643, AW301350, AV762098, AI805607, AW303196, AI334443, AV763633, AI499938, H01583, AL037683, H01483, BF677892, AL041690, AV760391, AF330238, AA587604, AL046409, BE893169, AW274349, BF241967, AL048626, AL045053, AV761745, AA631507, AL040921, AI963720, BG116150, AV761362, BF690726, AV760389, AV764530, AI307608, AV763540, AL119691, BF668217, AV759704, BF676981, AV759204, AV762959, AU140493, AU147104, AI431303, BF680074, AA581903, AI270117, AW812477, AW965008, AV710066, AW021583, AW088846, BG059568, AW072923, AW193265, AV728425, AA610491, AW419262, AW518220, AI613280, BF475381, AA129446, AV760777, AA594725, AV725423, AV762139, AV760937, BE562953, AA723017, AL039996, AI254316, AI281881, AL042377, AW576391, AI350211, AW995093, AW502975, AW574794, AW188484, AV763354, BF311000, AV733830, AU118745, AA490183, AI708009, AI610920, BF697673, AI862409, AA563926, AV757607, AV735495, AI305766, AA584082, AW406447, AI192631, AV740801, AL046205, AW270270, AV742057, AI367497, AI537506, AV762050, AV761489, AW245747, AI457397, AA577906, AV764329, BE252421, AI076616, BF792268, BF965232, BF965007, AW276827, AU152722, AW265385, AI345654, AW662543, AW969629, AI097429, AL134972, AI754955, AV756220, AI821271, AI537955, AW501386, AV658688, BF918590, AL120687, BE150580, AI924251, AV735370, AV763255, AV764228, BG236735, AV762111, AL044940, AV764578, AI732865, AW960468, AW974109, AI370074, AA547979, AI625244, AV764398, AW276586, BF919090, AC004084.1, AK025420.1, AK026441.1, AB01110.2, AC008569.6, AC005696.1, AC009996.7, AP001717.1, AL160269.14, AC008372.6, AL355543.13, AC009756.9, AC009412.6, AL139317.5, AC000025.2, AC005015.2, AC005077.5, AL132768.15, AC009516.19, Z85986.1, AF053356.1, AC006329.5, AP001695.1, AC006480.3, AC007318.4, AL359091.10, AC004963.2, AL023284.1, AC011497.6, AC004686.1, AL138724.12, AC011495.6, AC068724.7, AC012476.8, AF196779.1, AC005081.3, AC008610.6, AL139415.10.

				AP003357.2, AL022721.1, L44140.1, AL035367.5, AC010789.9, AC012170.6, AC010319.7, AP001688.1, AL163249.2, AL139330.17, AJ003147.1, AC021016.4, AC020904.6, AC005839.1, AC004166.12, AC007055.3, AL353807.18, AL161747.5, AC008543.7, AC004089.25, AC010326.6, AC011811.42, Z93017.6, AC004832.3, AC004638.1, AC019205.4, AL133367.4, AL133477.16, AL049759.10, AC011475.6, AL354707.17, AC002350.1, AC005695.1, AJ300188.1, AC009220.10, AC005291.1, AC005821.1, AC025594.5, AP001670.1, AC005037.2, AC005670.1, AL118520.26, AC004019.20, AC011442.5, AC009228.4, AC006285.11, AC005520.2, Z99716.4, AL117381.32, AC020906.6, AL356299.16, U91326.1, AC002565.1, AJ400877.1, AL109804.41, AC068533.7, AC009144.5, AC005940.3, AC022211.5, AL133284.13, AC009137.6, AC006241.1, AC006965.3, AF131216.1, AF334404.1, AC003037.1, AC008280.4, AC008403.6, AC008481.7, AC008567.4, AC006449.19, AL121601.13, AL133174.15, AJ312686.1, AC026464.6, AP001725.1, AL583856.6, AC044797.5, AL135839.15, Z97054.1, AP001714.1, AL035587.5, AC022150.5, AL096840.25, AC007193.1, AL162231.20, AC002316.1, AC008760.6, AL445686.14, AC007227.3, AC006435.7, AC006960.1, AC087071.2, AL138784.30, AC010654.8, AC005911.6, AL354932.26, AC005914.1, AL021878.1, AC005052.2, AL160471.5, AL034380.26, AE006463.1, AC024028.10, AL096841.6, AC008812.7, AC025262.27, AL121890.34, AL049776.3, AL022163.1, AC006211.1, AC078878.20, AL136137.15, AC007991.7, AC005527.3, AL035458.35, AC005837.1, AP001748.1, AP001671.1, AL590763.1, AC007546.5, AP001753.1, AL590762.1, AL135927.14, AL158830.17, AC016025.12, AL022238.1, AL050335.32, AL121972.17, AL031283.26, AC008491.6, AC084881.19, AC069548.4, AC005231.2, AL161656.20, AL445222.9, AL049795.20, AL135901.23, AC004453.1, AL109935.39, U95742.1, AC005620.1, AC007298.17, AL352978.6, AL109797.18, AL356915.19, AL162426.20, AL139809.16, AC011487.5, AL023553.5, AC067941.7, AF129756.1, U80017.1, AC004821.3, AC010458.5, AL354720.14, AL096701.14, Z69666.1, AL031587.3, AC002549.1, AC026172.3, AC011816.17, AC004840.3, AC011448.3, AC010271.6, AL133485.3, AL133448.4, AL160237.4, AC011479.6, AC005488.2, AC022596.9, AC007666.12, AC006483.3, AC006512.12, AC008519.4, AC007005.3, Z83844.5, AC084864.2, AC005778.1, AL133551.13, AC005971.5, AL020993.1, AL121891.22, AL391827.18, AC027125.4, AC025593.5, AC005295.1, AC024561.4, AC012306.11, AL096776.12, AL157372.18, AB038653.1, AC006251.3, AC018644.6, AC005086.2, AC018808.4, AL033521.2, AC005562.1, AC004867.5, AF001549.1, AC004965.2, AC005519.3, AC007676.19, AC008115.3, AL513008.14, AC009263.6, AL136418.4, AL139054.1, AC000360.35, U62293.1, AC010378.6, AC027644.9.	
HHENK42	234	493724	1 - 642	15 - 656	AV733437, AV741309, T99342, T89134, BF965245, T89227, AL124784, AL371593, AI871691, AA078184, AA228894, AI370470, AI362694, BF244465, BF980463, AI630413, AI246594,

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HHEPD24	237	498227	1 - 224	15 - 238		AL525047, BE267465, AU119027, BE728398, AU142237, BG034269, BE797542, BG110205, AL525046, BF446035, AW966408, BE695857, AA447885, BE261226, BF852227, BE858413, AU159593, AV749929, BG178599, BE856576, AA424770, AL338990, AW135009, AI423774, AI334334, AW959286, AI766429, AA417903, AA933079, AA424903, AL047160, AI685395, BF477465, AW139987, BF948688, BF745006, AW769824, AA641849, AW371401, AW371406, BF745011, AW613024, BG056135, BF744933, BG058480, AI720305, BF744994, BE828620, BF744932, BF744930, AI250926, BF760364, AA593807, AI969741, AI263347, BF744931, BF745007, AA383851, AA482522, BF745014, AI686024, AA447724, AW613546, AW614328, AI766856, BF995409, BF745010, AA644474, AW197307, AA641850, BF852819, AA383850, AA325769, BF955849, AK023968.1.
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HHFEC49	241	905849	1 - 2249	15 - 2263	W72062, A1827219, A1631461, W76255, AW449295, BF848562, BF849620, A1354957, A1222040, A1913803, T62772, T62921, T63781, AA364800, AF088057.1.
HHFCR93	242	865581	1 - 1821	15 - 1835	AL513572, AL537139, BE869616, AL513571, AW190823, BE868295, BF528807, AW959200, BF998261, BF986378, W52782, BG009530, AA707399, A1921717, BE161072, A1656071, A1809901, A1870870, AA780017, AA046658, AA913618, A1633244, BF995431, AA428298, A1014541, AW300019, AW173046, AA428713, H12307, BF432551, H12782, BF115565, A1141481, A1092488, BE550395, W58612, AW172540, A1184646, BF222972, W58613, A1359381, AW361707, BE043092, A1970137, A1126255, R77354, A1624748, A1949837, AW081182, A1923177, A1187105, BE707255, R69232, AA514466, BF995428, A1521359, R69114, BG011026, A1347221, R76149, R73827, AA664044, R79810, H12841, AW594241, R78260, BG015155, BG002356, BF851373, H12629, R76098, R32862, R63063, R78261, T47327, A1189377, R73853, R62315, R68433, A1828342, R79923, H12360, AA618505, H12680, T50332, R79910, AW903922, AA733001, R35438, A1216465, AW903849, T98690, R73852, R81664, H00855, AA683601, AW009057, A1873711, AW513081, R33685, H02334, A1189455, AW365832, H02440, R67936, H02804, A1569353, R66838, R68432, H38189, R76065, R64387, R75889, R33581, R35749, AW235425,

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HHFHJ59	243	411332	1 - 647	15 - 661		AA833770, AW877426, AA804902.
HHFHR32	244	411470	1 - 1364	15 - 1378		AL575554, AI949994, AI417813, BE176604, AL537293, W63587, AA555104, AV735759, BF433756, AW473655, W55970, AW779675, BE245761, AI436026, AI697597, BF446687, BE222143, AA310582, BE244564, AA725099, AA451851, AA860527, W49508, AI096339, BE218117, AA232777, AI082094, AL538385, AI160565, AA805441, W49509, AV741987, AI095778, AL538384, AA465271, AI685283, BE328263, AA233859, N62880, BF477950, BF240776, AV740618, W67453, W26654, R66448, AA347415, BE879790, AI301421, AA910440, AA815180, AA947419, AW388859, BE176537, AA806906, BF796176, AV716929, H04548, AA743984, AW294389, AW978207, D80074, AA953439, H53694, BF935876, D82288, BF971117, N26986, AA057527, R14689, BF794295, BF213700, W55969, BE893895, BF931384, AV743289, AW612155, H04469, N77787, R42413, N40108, BF243047, AA988864, BF240864, BE836282, BF239091, BE243458, N79387, D80452, AA910721, AV654871, BE887608, AV753942, M85866, BF243539, AI016440, AV754341, AV753874, AA013030, R13766, AA380256, BE244756, H59471, H59945, AW952223, AL080076.1, AL121977.11, AY026275.1, AY026274.1, AY026272.1, AY026271.1, AY026267.1, AY026266.1, AY026265.1, AY026264.1, AY026270.1, AY026262.1, AY026268.1.
HHFOJ29	245	1127491	1 - 1352	15 - 1366		AA776789, AI190772, AA428791, AI025500, AI219913, AW082984, BE241726, AI219933, AA628326, AW204939, AI698565, AI809744, R28215, AA913953, BE242686, AA477200, AW505434, T12580, AL157938.22, AK024434.1.
HHGCM76	246	662329	1 - 697	15 - 711		AW248957, BF828801, BF828604, AI675194, AW028119, BF826770, BF827069, AW452880, AI491913, AI799880, AW450970, AI377883, AI201976, AA595164, AI088096, AW612440, BE792795, AW006952, BF063362, AI697133, AA643065, AA580017, AI819005, AI866931, AI560641, AA635584, BF446220, AI829011, AW952316, AL524066, AW243832, AI200458, AI634449, AI670745, AI269568, AA326815, AI873666, AL523219, AL520944, AI478177, L31980, AW245254, AW194690, AW771866, AI767850, AW079488, T87766, D45523, BE242113, AA055697, AI306732, AW275312, BE280419, AI908657, R48473, AA013188, AI908646, BG250796, BE796614, T72628, BC002980.1, AC003665.1, AC003665, AC003665.
HHGDF16	247	579890	1 - 876	15 - 890		AI365221, AI701000, AW954119, AW264473, BF344449, AI680921, AI492007, AW014989, AI860823, AI539819, AI473662, AW628976, AW276150, C75362, AU152947, AA167428, AI559629, AI811077, AI039475, AI656542, AI284462, AW590370, AI431949, AI656530, AW148492, N67246, AI915180, AA907555, AA047467, AA478729, AI365222, AI242862, BE018520, AA834839, AA412178, BE302119, AI823337, BF671770, T61838, AW007865,

HHGDW4 3	248	554613	1 - 1036	15 - 1050	AA905198, H08613, AL382420, AA776507, AA385375, T94765, T94766, AA047401, N53320, AW890140, BF949155, N83376, BE883645, AV701945, AV704429, AW890022, AW898540, AV702726, AV703584, AV703624, C01033, AV702464, AW890015, AW956618, AV655824, AV708871, AV729091, AV704729, AV656250, AV655597, AV701800, AV705652, AV703976, AV707059, AV705178, AV661490, AV727054, AV701616, AV709625, AW956781, AW964267, AV706912, AW890016, AV709236, AV701584, AV726913, AV704346, AV728464, AV707827, AV693230, AV687808, AV705939, AV708600, AV705045, AV704029, AV702601, AV655568, AV727449, AV701067, AV727266, AV705517, AV650430, AV704588, AV702830, AV702086, AV728521, AV725260, AW951773, AV726646, AV703833, AV705813, AV729463, AV705474, AV703653, AV726903, AV725970, AV707500, AV728256, AL133418.4, AK023144.1, AF214114.2, AF208045.1, AF227899. 1.
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					AC012320.6.
HHPEC09	249	695726	1 - 474	15 - 488	BF936014, BF926087, BF849807, BG059559, AA663575, BE464797, AL137451. 1.
HHFGO40	250	129927	1 - 988	15 - 1002	AL533025, BE464963, BF110244, AW085558, BF110283, BE348401, A1343272, BG149420, BE327679, AA719308, AW298394, AA425555, BF939779, BE669809, A1356804, AA719641, AA92881, A1458306, AA928875, BE221905, A1304915, BF064266, W52908, BF433114, R43953, AA235409, Z38804, AA890287, A1928712, F02482, BE503857, AW470411, BF940932, N63308, AW023387, BG149175, BG150134, H87740.
HHSDX28	252	553494	1 - 1099	15 - 1113	AA548981, BF835253, BF835251, AA854044, A1784057, AL034420.16, AC006060.1, AC025470. 4.
HHSGW69	253	1031514	1 - 1240	15 - 1254	AL513747, A1471444, AW575981, AL514981, BE464687, A1680397, AW250860, AA443679, AW190582, A1016300, BE208802, BE677937, A1762491, AW005756, A1423058, A1889976, BF740099, AA688110, BF439136, AA236988, A151706, A1151175, A149250, A1857951, AA465243, A1184067, A1470019, AA648751, AA767036, A1514428, AA760772, A148022, A1376193, AA620304, A1590164, AA432092, A1690684, BE206650, A149452, BF109000, A1122856, A1139610, A1857891, AW151981, BG165103, AA594607, A1446233, A1339706, AW511682, AA830750, A1400834, A1299163, A158915, A1493683, AW008773, A1052397, A1366856, AA862320, A1678577, BE782115, N49406, AA456597, BE903997, AW439567, AW182774, A149180, N35037, A1312716, AA861194, AA857737, BE513773, AA283780, W74483, A1750986, AA476362, A147427, AW292534, AA528048, H41415, AA908632, AA027045, BF530166, BE312667, BF111407, A1269463, A1678336, AW007950, BG057058,

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HJ/ABX32	255	487807	1 - 1047	15 - 1061	AA865673, AI807718, AA937805, BF350664, AI525220, AD000833.1, AF019563.1, AF019562.1, AJ010098.1, AD000864.1, X78928.1, AF072845.1, BE385796, AL048522, AI114843, AV723581, AI114842, AA565480, AA310353, D80486, D60174, BF953264, D60503, D59975, BF950356, BF950358, D60175, AW612691, AI972034, BE677654, D81110, AJ017365, N71311, AA248844, AW953422, D80968, D60623, H22225, AI439412, N71362, CI5057, AA907114, BF953271, AI783844, AI086417, BE254805, AI088382, AI13642, AI971901, AL122053.1, AF220022.1, AF220021.1, AF045239.1, BE348441, BE644740, AI912665, AA310811, AW504485, AV763026, AV763058, AW502796, AW500029, BE207631, AI732151, AL079734, AV711465, AW327624, AI357823, AA469327, N42040, AW970877, BF681619, AU152561, AW148507, AI040051, AW302909, AI188390, AI654285, AV759632, AW855803, AW855730, AI753113, AW190505, AV760918, AI755202, AI066646, AV758097, AA573033, BF751949, AL042756, AA602557, AA491960, BE062476, BE062478, AW769151, AA613624, AI037897, AI171941, AW571499, AI753037, AI366902, AA809546, AL048135, AA877992, AW468003, AL047879, AL119438, AL120959, AW274072, AC068799.14, AC009087.4, AC003041.1, AC006441.13, AC005874.3, AF134471.1, AC005701.1, AL049820.23, AP001717.1, AL049715.25, AC022392.4, AL034549.19, AC006165.1, AC005971.5, Z85986.1, AL138960.16, AC008569.6, AC007052.4, AL035690.10, AC012627.4, AC002531.1, AC008897.7, AC011500.7, AC019205.4, AJ229041.1, AC005520.2, AL162615.13, AC006285.11, AP000512.1, AC005377.2, AB023051.1, AF053356.1, AC012476.8, AL354808.24, AC005255.1, AC007899.3, AC004859.2, AL136308.4, AL118502.38, AC008733.7, AC011464.5, AC025166.7, AL109827.8, AL133211.9, AC018809.4, AL034418.5, AL391684.6, AL138885.21, AL353812.13, AC004929.2, AL356257.14, AC007374.6, AC007956.5, AL109627.18, AC019206.4, AL139321.28, AL096791.12, AL391114.12, AC090958.1, AC005829.1, AL451125.7, AC005077.5, AC018758.2, AF168787.1, AC000360.35, AC006111.3, AL136295.3, AL161672.13, AL121890.34, AC009144.5, AC007679.4, AC006116.1, AL121989.12, AP000246.1, AC073316.6, AC080012.20, AL133355.12, AC083871.2, AC053467.1, AC007318.4, AC079383.17, AL163279.2, AC006511.5, AL080243.21, AC006077.1, AL391259.15, AC004983.2, AL139100.9, AC006001.2, AL049646.19, AP003357.2, AC011443.6, AC003962.1, AC011479.6, AC011448.3, AC008753.8, AC008440.8, AC008687.4, AC009331.5, AC015987.5, AC010149.8, AC079754.4, AL356299.16, AL117692.5, AC008750.7, AC018635.6, AP001710.1, AC009073.8, AL136173.24, AP001432.1, AC003982.1, AC004894.1, AC005682.2, AF064861.1, AC008962.8, AC008507.8, AC004417.1, AL109947.19, AC009570.13, AF111167.2, AC008745.6, AL359091.10, AL445483.13, AC005399.19, AP002392.3, AC010422.7, AL157791.4, AC005000.2, AF134726.1, AL022329.9, AC006312.8, AC012368.6, AL034380.26, AC003957.1, AC010203.13, AC015968.4, AL022156.2, AC017070.9,
HJ/ACA79	256	562729	1 - 873	15 - 887	

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HJACG02	257	1307789	1 - 561	15 - 575	<p>AA311223, BF002026, N41594, N30820, BF982046, A1829327, BE047833, A1457369, AW071417, BF968205, A1340627, R36271, AL036980, BF061283, BG168549, AW022682, BG034550, AV682418, AL047042, BF343172, BG113299, AW020693, BF751308, A1452560, A1690748, A1349645, AW946806, A1340511, BF924882, AW074869, AW196299, AL038445, BE781369, AW302992, BG110684, BE887488, AL514193, A1310575, BG164558, A1340533, A1349957, A1433384, BF680133, AV715560, A1309401, A1345005, BG163618, A1343112, AV743962, A1826225, A1811785, A1494201, AW054931, AW268302, AW301300, A1349598, BF672397, AW072719, AW075207, BF526020, AV741327, A1345735, BG036846, A1697243, BE536058, AW193134, A1889147, BF904189, BE910373, A1500077, AA225339, BE138712, A1307210, BG033723, A1589267, A1269862, BE885353, A1313320, BG058150, BE886728, AW827106, BF527014, A1313352, BG110517, AL039086, AW079336, A1251434, A1274728, BF868928, A1524780, A1589947, AV682724, A1439717, A1312146, A1312339, A1814087, A1345745, AL036925, A1345258, A1932638, A1470651, AL036857, AW050578, AW196105, AV682227, A1306705, AW269097, A1620639, A1611348, AW090393, AL042628, AW152469, AA833760, BG256090, A1866798, AW074993, A1567351, A1431424, A1349614, A1311604, AW105601, BE966990, AL044207, AW167918, A1611738, AW169604, AW268253, A1862144, A1567612, BE886827, BF793308, A1890806, A1349256, AL036664, A1554821, A1312152, A1955906, A1336495, BF970768, BF885000, AW075084, AL120854, BE895585, A1950664, BE897632.</p>

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HJACG30	258	895505	1 - 1518	15 - 1532	AA311188, BF940968, AL478697, AA309875, AA481249, AL533052, AA481563, AW242463, AA760629, AV651897, AV660258, AV661286, AV709580, AV653353, AV726590, AV703632, AV725255, AW960067, AV705453, AV726243, AV652001, AV704144, AV726194, AW956292, AW949777, AV708520, AV727618, AW959858, AV656283, AW967329, AV727932, AV728953, AV725582, AV708786, AV708872, AV661369, AW952013, AV705340, AV704234, AW965148, AV726156, AV705836, AV708991, AV725618, AW952301, AW958796, AV725596, AV709248, AW959986, AV726337, AV709407, AV728355, AV725031, AV707948, AV725441, AV729424, AV652528, AV725577, AV707556, AV704626, AV702071, AV706223, AV705665, AV704785, AV728404, AV709733, AV729366, AV708320, AV705343, AV727822, AV707264, AV704611, AV729473, AV702738, AV725321, AV690930, AV728743, AV727978, AV727337, AV727562, AV729129, AV704712, AV701953, AV727052, AW955629, AV729532, AV704520, AV706964, AV704973, AV702817, AV705504, AV709356, AV704279, AV705829, AV702164, AV701880, AV701626, AV707401, AV704756, AW955019, AV701183, AV728289, AV708203, AV703591, AV697880, AV647941, AV703417, AV753624, AW963446, AV654035, AV709935, AV726628, AV707654, AV706290, AV655552, AV654282, AW949521, AV709880, AV709939, AV705189, AV704686, AV706882, AV727314, AV702954, AV727238, AV691615, AW967328, AV682997, AV727126, AV727347, AV728652, AV702787, AV706162, AV709596, AV686417, AV701728, AV701873, AV656240, AV692972, AV694871, AV705239, AV727459, AV655901, AV728715, AV701499, AV703972, AV703090, AV707794, AV702790, AV728546, AV705267, AV703762, AV703273, AV706734, AV702854, AV709025, AV706025, AV705684, AV656224, AV705299,

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HJB AV55	259	823510	1 - 2427	15 - 2441	AI114732, BF795470, AV725374, AW978731, AV697184, BE348357, AW574676, AW468488, AI422235, AW403456, AW172608, AV720987, AW963469, AA984071, AW962820, AI808224, H09913, BF905846, AA984110, Z44373, H08018, BF351879, C15421, AA356055, AA824478, AV695390, AA714545, BF352101, BG058202, AA832247, AW905573, AA837439, R54588, D81928, R34641, AI361205, R42547, BF511013, AA729490, R49170, R14777, T95534, BF935740, T10260, T95535, AW137321, H07922, AW905578, AW905515, T10261, H09818, Z21036, AA364516, AW835292, BG036108, AU131345, BE165266, AA093879, AA095535.
HJBCU04	260	877643	1 - 1178	15 - 1192	BE559708, BE560064, BE561205, BE396781, BF975879, BE559864, BE267986, AW964091, AW084454, BF796667, AI339413, BG106279, BF663626, AW964099, AA714519, BE267607, BE396583, BE267550, AA568144, AA312661, AW135205, AA767738, AA311112, AA252797, AA310964, AA977844, AA835549, AI832051, AA357111, AW971671, AA356801, AA746595, AI368885, AA380418, AA827647, AW407267, AW404968, AJ010059. 1.
HJMB118	261	545492	1 - 1007	15 - 1021	AI928477, AA527494, AI871626, AI694451, AI613494, N21002, AI630897, AI609811, AA987612, AI373242, AA595033, AW271584, AI858763, BF111620, AW975076, AA281453, C06206, H85386, C05666, AI536332, T23579, R22308, AI125182, AA488619, AI914281, R45226, R37773, Z40129, AA658001, N66912, N78467, BE778573, AA211234, AL119049, AA928812, AC007622. 28.
HJMBN89	262	565675	1 - 1050	15 - 1064	BF339033, BE906189, BE540359, AI094289, AW674509, BE540821, AW675120, AI866870, AA331980, AA456759, BE545089, AA866039, BG113493, AI926593, AI538850, AI804505, AI539260, AI799183, BE966011, BE965121, BE964512, AI433157, AI648567, AI690946, AI554821, AI561170, BG252929, AW151136, AI539771, AI515087, BE897632, AI432644, AW673679, AI537677, AI494201, BF812963, AI500659, BE883591, AI866465, AI815232, AI801325, AI500523, AI859991, AI887775, AI582932, AI590043, AI923989, AI872423, AI284517.

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					AK000391.1, BC009010.1, AL049996.1, BC008920.1, AL122050.1, AB060876.1, AK024538.1, BC001655.1, S7771.1, AL136892.1, BC002958.1, AL122049.1, AK026648.1, AL390154.1, AL136765.1, AK026927.1, AL049324.1, AK027102.1, BC008364.1, AL137478.1, AF218014.1, AL390079.1, AF199509.1, AB047631.1, BC000054.1, AL136763.1, X82434.1, AF217991.1, BC000253.1, AB047953.1, AB060929.1, BC007420.1, BC009333.1, AK007383.4, AL137627.1, AK026086.1, AL133084.1, BC002816.1, AL117587.1, AK024747.1, AL117416.1, AL389957.1, AK027213.1, AL117460.1, AB056372.1, AL080126.1, BC003122.1, AL136805.1, AK024570.1, BC005007.1, AK027081.1, AL050277.1, AK026528.1, BC003548.1, AL049430.1, AK026746.1, AK024986.1, AF094480.1, AB063079.1, BC007294.1, BC007567.1, AK024855.1, BC007534.1, BC004181.1, AL110218.1, AK024524.1, AL590076.3, AL122104.1, BC007634.1, M85165.1, AK025435.1, AF195092.1, AK000197.1, AL137550.1, AL136774.1, AL133623.1, BC000785.1, BC000725.1, BC005805.1, AB060837.1, AK025084.1, AK027311.1, AK027164.1, BC004333.1, AL162062.1, BC002473.1, AL136784.1, AK026506.1, BC000077.1, BC001418.2, BC003410.1, AF076464.1, AK024594.1, AF245044.1, AK026642.1, BC003101.1, AF069506.1, AL359600.1, BC002355.1, BC007255.1, AL353957.1, AL136844.1, AF232009.1, AL512733.1, BC003682.1, AB049880.1, AF217982.1, AK000257.1, AL359601.1, AL050149.1, AF252872.1, AF058921.1, AL096744.1, BC002697.1, AL110228.1, BC004556.1, BC004191.1, AL133606.1, AL389982.1, AL445143.2, BC004960.1, AF271350.1, AB049892.1, AL389939.1, BC004883.1, AK027096.1, AL162008.1, AB055370.1, AK026164.1, AF177336.1, AB063046.1, BC006159.1, AL157483.1, AB063077.1, BC004131.1, BC006525.1, U57352.1, AL137656.1, BC001844.1, AF155827.1, AK026434.1, BC001082.1, BC000348.1, AB050510.1, M19658.1, BC004117.1, BC009311.1, AL137560.1, AF132676.1, AF061836.1, AL359596.1, AF017790.1, BC002466.1, AK000344.1, AK000323.1, AL359615.1, AL583915.1, BC002481.1, AL110280.1, AY034001.1, BC006332.1, AL512750.1, BC003651.1, AF090943.1, AK026480.1, AL049314.1, BC004362.1, AK025092.1, AB048975.1, AL390139.1, AL136843.1, AF132730.1, BC000714.1, AF061795.1, AF151685.1.
HJMBT65	263	596795	1 - 607	15 - 621	AW952560, BG168943, BE467261, BE177934, AW069580, AI890128, AW273443, AJ744746, AI379922, AI522079, AI032260, AI279840, AA281064, AI879924, T66144, H11614, AW194179, AI085109, R55392, AA335275, BE178118, N99235, AA257070, F09767, AA257163, AW972958, BF769935, AW293807, C02264, AA988919, AA357316, AI699614, BE936621, R47297, BF037710, AW881403.
HJMBW30	264	491209	1 - 870	15 - 884	BF689071, BE747537, AI922821, AW170567, BE906428, AA494514, BE879640, AI815043, BE673226, AI420757, AI751544, AI587576, BE223099, H28718, AA939115, W57617, AI143025, AA291927, AA291926, AW183956, AI587557, F26397, F29408, AI127566, AI565236, AA661632,

HJPAD75	265	651337	1 - 1217	15 - 1231	<p>BF765308, BF338229, BG034851, AW883883, BE774322, BF808197, AA211229, AC013356. 8.</p> <p>AL530365, AL524811, BG035149, AL524846, AV653215, AL525028, BF031163, BE464161, BF064198, BG057645, BE677690, AV714679, AI954819, AA708718, AA773040, AW206827, BE677490, AW590005, AL522800, AI075390, BG179367, AI933314, AA022693, AA563665, AI582700, BF591973, AI933036, AA011394, BE463890, AI304827, AW467513, AI675049, N47573, BE537595, AI075392, AI346305, AL514603, W26975, H02832, AI290715, AA535130, AW137781, AW298065, BF927479, AA917670, AA011431, AL530366, AA974770, AA535120, AI497684, AI277012, AI274193, AL514604, AW297638, AW779938, AA356778, AW067366, AI524812, AL524847, BF763877, AV652546, H03723, F09604, F09318, H83110, AA216050, AW573003, BF926201, AI572540, AL525029, BF092250, D80466, AI940747, AK027129.1, BC008984.1, AF043945.2, AL163284. 2.</p>
HKAAE44	266	564406	1 - 1480	15 - 1494	<p>AL520657, AL520658, AL522597, AV681522, BE548729, BE809593, BE790785, BE792835, BE732295, AA034095, BF207081, BG104235, BG248527, AA099014, BE797840, BF149380, BF529516, AA443460, AA521261, BF128722, BE262937, BF149417, BE560958, BG231704, AI380466, AV708717, AL522596, AI601258, BE279990, BF972266, AI922591, AI568423, AA521360, AI340192, AA576296, AI018766, AI292077, AI149390, BE222604, N26097, BF683179, N56989, AA156490, AI751520, AI362844, AI092927, AI885624, BE409895, AI554676, AA443342, AI144510, AI361418, N39813, AW073509, AI300469, AI302840, AA054959, AA134109, N26662, AA836018, BE546367, AI660772, AA045420, AI763377, BE559954, AA999788, AW262496, AI148818, AA576417, AA961788, AI918062, AA045314, AA156140, H23879, N36737, AA887768, W01353, AA420615, AA102403, AA099091, AA055421, R40598, AI686531, BF222554, AI421021, AA363039, H47023, H42173, AA811052, AA631072, H85513, AA130256, AI969959, AI093973, AA702964, N62818, AI826514, AA443329, AI632688, AA357703, AI470639, AI918816, AI472869, AA829362, AI868052, AA809432, AI186580, AA568573, AI241611, H23880, AI216887, H46484, BE265435, BE766321, AA778803, BF896430, N47374, AA356491, AA102402, BF054717, D12235, D12191, D12183, D12198, AI954721, AI500113, AV659451, AL043166, BG222794, AI798359, AI537677, AI648567, AI654286, AI560545, BG167830, AI927233, AI538615, BF812963, AI804505, AI815239, AI500659, BE883591, AI866465, AI474699, AI537643, AW983691, AI815232, AI866691, AI801325, AI500523, BF812438, AI538850, AA088789, BE885490, AI887775, AI582932, AI872423, AI590043, AI923989, AI284517, AI500706, AI445237, AI491776, AI289791, AI926593, BF811804, AW151138, AW983703, AI889189, AI521560, AW151974, AI285417, AI500662, AI623302, AI924051, AI539800, AI582912, AW172723, AI284509, AI538885, AI440263, AI889168, AI866573, AW058275, AI633493, AI434256, AI866469, AI434242, AI805769, AI888661, AI500714, AI284513, AI888118, AI285439, AI859991, AI436429, AI355779, AI623736, AI889147, AW194509, AI581033, AI371228, AI491710, AI431307, AI440252, AI440238, AL047422, AI567971, AI866786, AI860003, AI610557, AI431316, AI242736, AI784377, AI539260, AI828574, AI887499, AW151979, AI539781, AI431238, AI539707,</p>

					<p>AI702065, AI885949, AW089557, AI559957, AI285419, AI521571, AI872315, AI469775, AI932620, AI866581, AI696340, AL047398, AW074057, AI567953, AI815150, BC009283.1, BC009360.1, BC008417.1, AK000484.1, AL049423.1, AB060828.1, BC008840.1, AF132730.1, AC008897.7, AF249267.3, AF260566.1, BC004306.1, AL133607.1, AL137561.1, AF159141.1, AK026057.1, AL133084.1, AL133070.1, AL133655.1, AL136765.1, AL136763.1, AL136781.1, AL389982.1, AL049276.1, AB011076.1, AL050366.1, AL136615.1, BC002849.1, AL162066.1, AK026571.1, AK025015.1, AK027136.1, BC000386.1, AK026182.1, AK027222.1, AC023058.17, BC002942.1, BC008895.1, AF245044.1, AK026844.1, AC008964.6, AL080227.1, X83544.1, AK025377.1, BC008717.1, X66113.1, BC004533.1, AL136850.1, AF183393.1, U80919.1, BC009033.1, AL133053.1, BC002343.1, BC006494.1, AK025669.1, BC000538.1, BC007571.1, AK000250.1, AK025589.1, AL136825.1, AL133015.1, AL133608.1, AL133049.1, X99226.1, AB047819.1, BC005825.1, AB055361.1, AL136846.1, AL133051.1, AL161628.9, M64936.1, BC001115.1, AL136830.1, BC001328.1, BC003110.1, AJ010953.1, AB046105.1, BC003410.1, AL137463.1, AL080146.1, BC007522.1, AC026787.4, AL359618.1, BC004117.1, BC003024.1, BC006287.1, AL136845.1, AL031963.40, AC012067.2, AL356098.10, BC002516.1, BC004362.1.</p>
HKAAH36	267	1352332	1 - 1202	15 - 1216	<p>BE899189, BE747860, BE898407, BE898385, BE745465, BE388198, W73168, BE742856, AI002163, AW820357, W73140, BF513278, BE393948, AA862032, BE742548, BE272355, BF035167, BE746400, AW380655, N80762, BF033594, AW105502, W68496, AA292366, W68361, BF514439, BF350313, BE075958, AA394040, H43923, BC008036.1, AF168768.1, AF243527.1, AF135028.1.</p>
HKAAK02	268	589945	1 - 845	15 - 859	<p>AA552324, AA367607, AW827115, AL042753, AW772536, AV733824, BG122481, AI610645, AL042382, BF339483, BF792469, BE965355, BE965758, BF970990, AI686552, BG120816, AL042544, AA640779, BF339333, BG110517, AW967257, AI567351, AW089572, AW169653, BF885675, BF828567, BF339322, AV758110, BG257535, AV698087, BE965432, AV760391, AI696626, AV751784, AI446373, AI872914, BE781369, AA613907, BG164558, AI801325, AL042538, AW074993, AI349614, AV652027, AI312152, BE544111, AI612759, BG112879, AI345735, AW148320, AI349937, AW088903, AI679916, BF752252, AI537677, BE964636, BE963035, AI340519, AI922901, BF882334, AI064787, AL041772, BG112718, BE621256, BE620444, AI340603, BE964614, AI539771, AW827289, BF793324, BF344691, AI866002, BF960601, AI343059, BF726504, BF816455, BF343172, AI873704, AI349933, BF338002, AI919345, BE964812, AI364788, AW268253, AI251830, BE963918, AI366549, AI636719, BE964767, AI280661, BG031664, BE875407, AV755462, AI560012, AW403717, BE393551, AL119863, AW238730, BE047952, BG180996, AV760389, AW99049, BF814335, BF970449, BG058039, BE048087, AI680498, AI499920, AL514155, AA572758, AI539153, AJ933589, AI468872, AI866608, AI343112, AL1119457, AV720938, AW081255, AV746964, BE965192.</p>

					AI349256, BE887488, BF971016, BE964700, BF884999, AW074869, AI348897, AI889133, AL121328, AV738991, BE613727, BE964876, BF915208, BF344652, BG036846, AI823670, BF816811, BF904180, AI687065, AL039086, BG032919, AW083804, AI307708, AL513741, AI500659, AA259207, AI800433, AI800453, AI343030, AI682743, BE048071, AI282903, AA494167, AL037454, AV762619, AI309401, AI540850, AW088134, AI648684, BF816042, AI433976, BE964263, BF909758, BF981774, BE963838, AW303152, AV710950, BG113299, AV682672, AV682763, AL045500, BE904051, AL036802, AI589993, AI805638, AI439762, AW161579, AI499463, BE894455, AI867042, AI591316, BF695032, BE895585, AL036396, AW103371, BG032208, BF343764, AV764282, AI349645, BE965481, BG249582, BE172412, AA528491, BG165051, AV682849, AL514919, AW935969, AI686926, BF344201, AI613017, AI570384, BF795712, AL079963, AI620284, BE047852, BE876033, AV711355, AL135661, AI537617, AV711242, BE172767, AL513983, AW131954, AI571110, AI433157, AL514069, BG254981, BG252929, AW806761, BE909398, AW068845, AA635382, BF055737, BE904178, AI312428, AI687376, BE885131, BF032768, AW023590, AI952114, BF679324, BG027047, BE877769, AV681872, AV759518, BE965621, BF904194, AI498579, BG178809, BE874133, BE966839, BF904189, BF990167, AI678302, BF812933, AI349644, BE904902, AL036214, AL036274, AC005952.1, AB049585.1, AB015630.1, AL354808.24, AB049758.1, AC005876.3, AK025772.1, AB063008.1, AK026551.1, AF348209.1, AK026045.1, AC026464.6, AF090934.1, AL035458.35, AL137283.1, AF177336.1, BC008387.1, AC007383.4, AB019565.1, BC003683.1, AL050108.1, AC007375.6, AB048964.1, AF218014.1, BC006807.1, AK000652.1, AL512718.1, AK024538.1, AK027096.1, AB055303.1, AB060887.1, AL390167.1, BC008488.1, AL080060.1, AL121656.2, AF225424.1, AB056768.1, AL389978.1, AL442082.1, AL359941.1, AL136928.1, AK027113.1, AB048953.1, AB047801.1, AK000212.1, AL162006.1, AL157431.1, AF207829.1, AK026865.1, AL122093.1, BC008365.1, AL512754.1, AF104032.1, AF078844.1, AL136892.1, AL136126.34, AK026480.1, AB063084.1, AL136984.20, AL353940.1, AK026542.1, AL162373.16, AL121601.13, S78214.1, BC003687.1, AK025491.1, AK026504.1, AL049938.1, AL049452.1, AB047615.1, AK000137.1, AC005291.1, AK025958.1, AB060908.1, AL512733.1, AB060916.1, AF090903.1, AK026452.1, AL133016.1, AL096744.1, AK026592.1, AL050146.1, AF146568.1, AL136586.1, BC007021.1, AL389982.1, AK026532.1, AL133093.1, AL110221.1, AL080137.1, AL137527.1, AL050393.1, AB051158.1, AL136799.1, AF090943.1, BC002839.1, AL122050.1, AK026583.1, AL133640.1, AK025339.1, AJ242859.1, AK026784.1, AL136789.1, AB055361.1, AL353625.5, AK025092.1, AF219137.1, AL359618.1, AB060912.1, X82434.1, AB060826.1, AL110196.1, AB063046.1, AB056420.1, BC008417.1, AB056809.1, AL050116.1, AL512719.1, AB050534.1, AL122121.1, AB060863.1, AL136844.1, AL133557.1, AL136768.1, AL050149.1, AL110225.1,
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	269	565078	1 - 1224	15 - 1238	<p>AL136845.1, AL050138.1, AL133565.1, AL133606.1, AK026534.1, AB063070.1, AL049382.1, AB055366.1, AC006435.7, AL117585.1, AL121585.22, AL133075.1, AC006115.1, AF111847.1, AK026533.1, BC008070.1, AL049466.1, AC008897.7, AL512746.1, AL137538.1, AB062938.1, AL442072.1, AF106862.1, BC006195.1, AL359596.1, AF125949.1, AK026608.1, AL136787.1, AL133560.1, AF091084.1, Y16645.1, AF097996.1, BC001967.1, AK026744.1, AK025414.1, AL137459.1, AF131216.1, AF090900.1, AF090901.1, AK027868.1, AF183393.1, AL133258.16, AK026855.1, AL117583.1, AL122098.1, AB060825.1, AL359601.1, AF125948.1, AL136749.1, AL122123.1, AL049464.1, AK000618.1, AB055315.1, AK000445.1, AL137550.1, AB047904.1, BC002733.1, U42766.1, AL080124.1, AP001666.1, BC007199.1, AL162083.1, AL137557.1, AL133080.1, AK000432.1, AL049314.1, AK026959.1, AK025084.1, AK026741.1, AB048954.1, AK000083.1, BC001045.1, AL117460.1, AB060852.1, AB055368.1, AL117457.1, AL359615.1, BC004556.1, AF090896.1, AL117394.1, AL050277.1, AL117435.1, AL356747.18, AC015982.9, AL049283.1, AL512684.1, BE908972, BE871345, BE969781, AU127317, AW665494, A1650386, BF699086, BF432884, BF241722, BF087758, A1923936, AW271402, BF058229, BE349336, AA483696, BE504564, AV753084, A1553984, AA934906, AU148404, AU125401, AA521022, N53984, A1079322, AW015810, AA481668, AU120404, BE836738, AW959428, AA478921, A1341198, BF086194, A1559514, BF095983, AW439579, R78314, BF086179, BF992216, BF992222, BE930087, AA149227, AW627942, BF992221, AA831360, BE858967, AA300892, BF095985, A1909338, BE930086, AA331631, AL079584, AA971728, BF526589, T27345, AA515943, AW894981, BF086178, BG255010, AB007885.1, AC023426.29.</p>
HKAB184	270	862030	1 - 1175	15 - 1189	<p>AA715814, AA503019, AV762033, BE155099, AV734997, BF917346, AW338860, AC011666.28, AF242518.1, AF109907.1, AC004867.5, AC020917.4, AC004166.12, AL356915.19, AC005071.2, AC004878.2, AC005052.2, AC005081.3, AC002549.1, AL590763.1, AC020663.1, AC006064.9, AC008745.6, AC004858.2, AC022405.5, AC007666.12, AC008750.7, AL451144.5, AP001716.1, AC009131.6, AC004656.1, AL109825.23, AL355312.24, AL035086.12, AC010605.4, AC004067.1, AC004477.1, AC008736.6, AL109915.10, AC006023.2, AL033529.25, AC007637.9, AL139317.5, AL031311.1, AL049776.3, AC004971.3, AC009220.10, AL080243.21, AC005015.2, AC004686.1, AL022318.2, AC002310.1, AC009123.6, Z93015.9, AC021999.4, AL355353.23, AL050318.13, AL161756.6, AC011464.5, AL132712.4, AL359513.12, AC007546.5, AP001695.1, AL035683.9, AC018711.4, D87675.1, AL134444.4, AL139100.9, AF030453.1, AC006077.1, AC008895.7, AP001713.1, Z84487.2, AL357153.4, AL163636.6, AL359382.23, AC004770.1, AP001972.4, AC004675.1, AL355392.7, AC020906.6, AL138784.30, AC020754.4, AL162426.20, AC002288.1, AC009068.10, AC008101.15, AC008623.4, AC008891.7, Z98884.11, AL136137.15, AC011247.10, AL133163.2, AP001727.1,</p>
HKABZ65	270	862030	1 - 1175	15 - 1189	



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HKACB56	271	554616	1 - 482	15 - 496	AI935239, BE122852, U51140, BG121875, BF970449, BE879967, BE545287, AI311480, BF968910, AI207454, BG031442, BF815930, BF792050, BF339322, AI924051, R99209, AA669025, AA505147, AA806160, AK026797.1, BC000650.1, AB060839.1, AL133557.1, BC009192.1, AL136622.1, AB048888.1, AL512754.1, BC002485.1, BC004908.1, AF004162.1, AL358532.11, BC004181.1, BC006251.1, AK026603.1, AK000647.1, AK024974.1, S69510.1, BC008823.1.
HKACD58	272	1352202	1 - 3139	15 - 3153	AL528271, BE513051, BE874633, BE727126, BG119953, AA877796, BE897630, BE616928, BE873485, BE409112, BF568632, BE886189, BE890308, BE259677, BE389188, BE386943, BG033053, AW957771, AW880570, BE389298, BE782739, BE042596, AI829975, AW027434, AI335269, AI525602, BF382771, AA495894, AW402301, N46240, BE735624, BF887879, BE258030, AI819188, BE349022, AW008354, BF509970, AI683541, H38504, AI365603, AA178917, AA180758, BE812358, BG250135, BE874703, AW390227, BG029976, BE812223, AA354527, AA178918, AI204915, AW194439, AW390207, BF875432, AA425001, AW368379, R88102, BE932912, BF511057, BE932910, BE301126, BF912732, AI360437, AA370005, BE764970, R69656, R53778, BE830394, AA134615, BE697358, R54897, F37313, AL536107, AI280553, F34525, BE171591, AI524965, AW880505, F27458, AI193372, R55008, AW339374, AW999021, BF885645, AA227281, BF799341, BE410974, R55146, AI651533, AA355898, AA149032, H21738, BE937883, R78049, T74386, T27237, R69572, H22354, AW946340, AW169264, AI630501, AI699781, BG001443, AA343322, BF932030, AI971329, BF813656, AI096656, AI367032, AA380842, AL138431, H22385, BF929569, T50676, BE393507, D29121, AA668973, BF934053, BE206656, AI620083, AI493047, AI872461, H29733, BF793181, BC006159.1, X80590.1, AL050037.1, AC006457.3, AC006455.2, BC000224.1, AF075046.1, AL117382.28, AC009242.5, AC002565.1, AC009314.4, AC011005.7, AC007934.7, AF000547.1, AL442096.1, AC083866.2, AC008551.5, AC020550.4, AC002365.1, AF001548.1, AC008073.4, AC005225.2, AL590762.1, AC010792.4, AL365332.9.

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HKACM93	273	1352383	1 - 2338	15 - 2352	AA709155, BGI19984, AW519003, AA877551, A1200706, BF338058, A1422381, A717315, AU150354, A1754711, A1333933, AA548510, AU118207, AA419622, A1753594, BF577095, AA243811, AU144834, A1961432, BE926182, AA599372, AW316693, AW241333, A1474277, AW797789, AA417659, A1242450, A1393312, AA643987, A1089479, H92371, AW999395, AA243499, BE145749, AA758663, BE184602, T25086, AK000996.1.
HKADQ91	274	604123	1 - 1509	15 - 1523	BE728770, BE384888, BE728810, BE727084, AA167629, AW070815, A1366162, A1188162, A1984856, A1470107, BF337210, R53493, AW368703, R67659, Z25076, BE275724, BG118085, AW953270, A1879059, R53494, BF128982, N58974, A1341548, AA167659, AW403656, AA284184, AA236298, W47183, A1300467, W47444, A1374978, AA716348, BE885002, BF822200, H04939, A1805547, BF869959, AF129536.1, AF233223.1, BC007832.1, AY007380.1, AL035457.13, AC005792.1.
HKAEG43	275	889521	1 - 1283	15 - 1297	AW449289, BF108704, BE222750, AA431227, A1333314, AA825577, AW451583, AA432249, BF896306, T95377, T95297, A1349516, AA612984, AA629184, A1217747, AW007759, A1805363, AC005792.1.
HKAEL80	276	570865	1 - 1091	15 - 1105	

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HKAEV06	277	1352263	1 - 2482	15 - 2496	AU133136, AV762150, AW967049, AI114751, BF678978, BF698605, BE536006, AA317243, BE748143, BG163940, BE789994, BF724673, BG231175, H06819, R19670, AA081581, BF129960, AA334334, H26678, BF332901, BE159061, BE159060, BE159062, BF818584, BF819690, BG115835, BF986034, BF819681, BE872393, BG236735, AL118991, AA515224, BF822777, AW872676, AW630298, AI291124, AW872575, AI801482, BE677379, AI801591, AI873916, AI017024, AW794809, AI291268, AI061296, BE883501, AW467340, AA482681, AI200051, AI245679, AW467362, AA525790, AV681599, AV760191, AI192631, AA620411, BE677026, AW473163, AW102849, BE042475, AV738303, AV715162, AA348017, R97934, AV761745, AV764609, AV761286, AK001708.1, AK000169.1, BC008120.1, AL035246.13, MI3254.1, AC003681.1, AL022238.1, M87917.1, AC005779.1, AC011495.6, AC004918.1, AF045555.1, AC005757.1, AC022148.5, AC000085.5, Z70289.1, AC004926.2, AF085444.1, AC007570.23, AC007066.4, AP000513.1, AL139100.9, AC005089.2, AL133387.8, AC011442.5, AB023052.1, AC000052.16, AC005104.1, AC009225.3, U67828.1, AC005484.2, AF254822.1, AC004477.1, AL022721.1, AC004159.1, Z99128.1, AL356481.16, AC007021.3, AC006530.4, AC010642.5, AL355497.14, AC005940.3, AL049757.14, AP000744.4, AC010506.6, AL034451.26, AL139317.5, AC018828.3, AL080317.11, AC011500.7, AC022383.3, U63721.1, AC011464.5, AC007536.9, AL359457.12, AC004854.2, AC009412.6, AC011497.6, AC005057.2, BC004147.1, AL035681.13, AL356499.16, AL450226.1, AL022329.9, AL133332.12, U95740.1, AC002369.1, AC020750.3, AL122004.17, AC006452.4, AL021391.2, AC006312.8, AL158159.14, U78045.1, AC002984.1, AC083855.2, AC004662.1, M19045.1, J03801.1, AP000842.4, AC018758.2, AP000553.1, AL451125.7, AC004973.1, AC018751.30, AL133245.2, AC008486.6, AL391827.18, AC073316.6, AC006468.9, AL049759.10, AC004000.1, AC018809.4, L78810.1, AL355385.15, AC010358.5, Z98949.1, AC005204.1, AC027644.9, AL133376.6, AC004019.20, AL122023.3, AC005056.2, AJ003147.1, AC007011.1, AC005368.1, AL132838.4, L81693.1, Z68756.1, AP003357.2, AL122003.17,

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HKAFK41	278	545018	1 - 535	15 - 549	AW731712, A1984229, AW467342, AW304765, BE877315, AW083191, A1751170, BF968461, AA130811, A1698682, BG104768, BE504315, AL515743, AA628399, AL515742, BE890543, N50073, AA171899, N49092, BE897480, AV739544, A1698019, BE875495, AW612114, BE872122, BG105488, AL514280, BF839730, BF961737, BE172618, AA826581, A1743618, BF351788, BE502704, BF909218, AA249816, AA723906, BF541035, BE674507, AA625850, AV661774, AV661759, BC000194.1, AK027421.1, A1271091.1, AL137412.1.
HKDBF34	279	833065	1 - 1418	15 - 1432	AV652853, AV653898, A1792241, A1793025, AW242855, BF940314, BE048959, BF589928, A1767568, AA999850, A1911520, AW612416, A1765078, A1373739, A1793193, A1985237, AW779364, A1433883, A1478325, A1671437, A1613056, A1253234, A1524824, A1650909, BE465778, AW299600, BF211834, BF431418, A1431850, A1314483, A1470468, A1473091, AA345162, BF031348, AA065156, AA076448, BF212565, BE501448, AA282824, AL134259, A1862043, A1801088, AW880037, A1239701, AL120446, A159625, A1520946, W45039, BF840674, AL035890, AW020619, A1741637, AF229179.1, AC003669.1, AL583915.1, BC006103.1, BC003591.1, AK025099.1, A136784.1, AL137550.1, AK025117.1, BC008686.1, BC000534.1, AK025435.1, BC009398.1, AF232009.1, AK026762.1, BC007347.1, X15132.1, AF091084.1, BC002515.1, BC006410.1, AL080234.1, AL442082.1.
HKGAT94	280	762811	1 - 1034	15 - 1048	A1521417, BF991903, A1868973, T84785, AW273454, AA601327, AW753508, AA601278, T91114, A1821044, A1571543, A1791227, BG032943, AV758944, AV722075, AA055800, BF346320, AV753973, AW600804, AU148047, AU117305, BE075868, AU140392, A1734144, BE883679, AL041706, AW969824, AV760502, T74524, AV760154, H07953, AV763538, AA613164, AA683069, AF236698, AU144517, BF854333, BE731411, A1609972, AA904211, A1583468, AA601630, AW938345, AV742485, BE885138, A16284012, AW020088, AA515728, AV760014, AA613627, BF872337, AL037910, AW274078, AW274191, AL134330, AU118837, AA287618, A1306232, A1801141, AA601294, A1251576, BF346590, BG055660, AV710214, A1583466, AW664487, AW163763, AA805841, AU119532, A1253987, AA829065, AW962035,

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					AC011443.6, AC004754.1, Z85987.13, AC006312.8, AC005971.5, AC004477.1, AC010530.7, AP001630.1, AC007318.4, AC006261.1, AP001694.1, AP001746.1, L44140.1, AF207550.1, AC005519.3, Z93930.10, L78833.1, AC006330.5, AL121952.18, U80017.1, AL009031.1, AC006345.4, AL157760.9, AC021876.5, AP000210.1, AL031681.16, AC002316.1, AC002326.1, Z93244.1, AL133485.3, AL390061.9, AC008895.7, Z83844.5, AC003029.2, AC023880.5, AC008738.6, AC004472.1, AC003043.1, AC005102.1, AL050341.18, AC020550.4, AC004228.2, AC005667.1, AC009060.7, AP000115.1, AL109984.14, AL078611.1, AL359644.10, AC007216.2, AC022307, AC022307, AC022307, AL109945, AL109945, AC025388, AC025388.
HKGCO27	281	601969	1 - 1007	15 - 1021	AL499498.
HKISB57	282	625956	1 - 1478	15 - 1492	BG253059, AI888563, AW083174, AI890983, BE677527, AI742994, AA581853, BE208188, AA496043, AI749573, AI433172, AA912116, AU152415, AU151244, AA526295, W72233, AI708515, AA029171, AI289783, AA147482, AW001857, BE744941, BF851250, W76470, AI148076, AI619715, W32695, AI973179, BF856405, AA086231, AI536682, AI244167, AW205328, AA112137, AI015550, AI159953, AA449234, AA449289, AI886087, R48602, AW974749, R48705, N57904, W73612, AA515533, AI095398, AA086322, AA554446, AA317019, BE019888, R07096, AA894669, AA112027, T96414, AA923651, T96497, AI581984, AI093238, AW084446, BE834394, T65129, AA100811, BF767404, AA652428, W32694, AW364698, BF371383, AW390788, AI903419, AI903380, AI903350, AA300051, AW886927, H55267, AA029067, AA588851, AA588463, BF931116, BE646329, AW514396, T65909, AW578218, AW800794, R07042, AA625855, AA663955, AA687595, AI581808, R76016, W22074, AA043407, AA436950, H39017, BF814527, AI824576, AI702073, AI698391, AW080090, AI633062, AI608936, BE786043, AI358213, AI306705, AW983832, BE963838, BG179993, AW051258, AI677796, AW051088, BF856017, AI932794, AI366900, AI352497, AI889189, AW983829, AI270183, AW163834, AL514731, AI434468, AI812015, AI249877, AI679672, AW118518, BF812960, AI284131, AW029611, AI468872, AI699011, AI927755, BF792961, BE966388, AI886753, AW827289, AI564719, AV743962, BG108406, AI567846, AV741327, AI573060, AI783504, BG112718, AI620284, AI866770, AW198075, BF032768, AW083778, AL514899, AI611738, AI280732, AI619502, AI680162, AI802542, AW081255, AI280607, AI499285, AI570807, AW004886, AI452560, AW026882, AW151136, AI923370, AI627988, BF812938, AL118781, BF970652, BE789764, AW104724, AI670009, AI863382, AI433157, BE543089, BF812961, AI452993, AI624548, AI659795, AW079572, AI860783, AI633125, BF812426, F27788, AW089179, AI673785, AI915291, AI354998, AW152182, AI537024, AI917252, BE967261, BF725599, AW080746, AL120853, AW129659, AW163554, AI537677, AI499890, AI612852, BF526020, AI174394, AW192461, AI613270, AW105620, AL119863, AI520809, AI923989, AI036673, AI571909, AI803778, AI653979, BG036846, AW192687, AV682249, AL514357, AW839006, AI274507, AI632408, AI288305, AI635067, BG180273, AI612913, AL119828, AV682212.

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HKIYH57	283	543510	1 - 595	15 - 609	AK025254.1, AB060214.1, AL110222.1, X53587.1, AK026959.1, AL162008.1, AF218031.1, BC005151.1, AB047615.1, BC004370.1, BC006103.1, AY034001.1, AK000486.1, AL133098.1, BC003548.1, AL050108.1, AL122118.1, AB062978.1, AL136789.1, AL049452.1, AK025391.1, BC008284.1, AK000647.1, AB136786.1.
					AW449074, AI7479318, AW188217, N63794, AW474320, A1982639, A1916829, A1913880, A1248461, A1742524, A235863, A1022756, A1150430, A1148830, A1285991, A1969195, AA429131, A1026850, W35371, W32936, A235876, AL137629.1.
HKIYP40	284	580845	1 - 1201	15 - 1215	N34032, T10392, N57611, N52789, AA773302, BG111015, AA678643, AP001132.4, AL035413.19, AL050335.32, AC008755.6, AC004961.2, AC006038.2, AL022721.1, AP000704.2, AL159977.10, AC005280.3, AL109797.18, AL034376.10, AC087239.18, AC010205.5, AC008481.7, AL136137.15, AC005409.1, AP001727.1, AC005015.2, AC008397.7, AC004139.1, AC005089.2, AC073838.6, AC005792.1, AC010319.7, AC008754.8, AC072052.6, AC026172.3, AC002549.1, AL139330.17, U91318.1, AL049779.6, AC011475.6, AC005006.2, AC009077.7, AP000553.1, AC011736.4, AL135379.17, AL445490.6, AC009123.6, AC004491.1, AC018758.2, AC000025.2, AL138807.12, AP001710.1, AP001435.2, AC011491.5, AC018636.4, AC003093.1, AC005527.3, AP000744.4, AC008892.5, AL135749.3, AC004967.3, AC004382.1, AC005480.3, AC020916.7, AC002404.1, AC009471.5, AL135901.23, AC009120.8, AC005182.2, Z98742.5, AL138756.23, AP001671.1, AC000035.2, U63721.1, AC005081.3, AC020904.6, AL021707.2, AC006965.3, AC011444.5, AC008569.6, AC005736.1, AP000208.1, AP000130.1, AL1355385.15, AL109897.30, AC006111.3, AL031311.1, AJ295844.1, AF332577.1, AJ246003.1, AC007676.19, AL160270.19, AC008635.6, AC011497.6, AC002300.1, AL1353708.10, AC007383.4, AC005098.2, AL139099.2, AC008873.4, AC004150.8, AC005529.7, AL137229.4, AC010145.9, AC007637.9, AP001759.1, AC011470.5, AC012384.16, AF045555.1, AC022384.4, AC002565.1, AC004166.12, AL117377.18, AC020552.4, AL031681.16, AL049694.9, AC006430.22, AP003357.2, AC008891.7, AL161669.5, AL049776.3, AC006057.5, AL121972.17, AL096791.12, AL590763.1, AC004019.20, AP001748.1, Z99128.1, AL139286.13, AC011472.7, AC008126.9, U91326.1, AP000116.1, AL121751.12, AP001630.1, AC004851.2, AC006452.4, AC004695.1, AC006011.2, AL391827.18, AC011489.6, AC009996.7, Z82208.1, AC004587.1, AC004878.2, AC018809.4, AL135839.15, AC073934.1, AC010271.6, AL031587.3, AC016776.6, AC011500.7, AP001717.1, AL451162.14, AC002357.1, AL031228.1, AL121749.13, AL357752.19, AL160175.5, AC009060.7, Z77249.1, AL513128.11, AC020906.6, AL022313.1, AL050318.13, AP001753.1, AC020913.6, AP001469.1, AL162426.20, AL034550.31, AC010605.4, AC011540.3, AC004867.5, AC007842.1, AC018682.4, AC079602.15, AC013449.8, AC026765.22, Z83840.7, AL139317.5, AC011811.42, AF271897.1, AC005800.1,

						AC009131.6, AL139353.3, AL121658.2, AC000082.4, AL135841.11, AF038458.1, AC005288.1, AC022415.5, AC007954.7, AC002543.1, AC025166.7, AC090514.1, AC008474.7, AL121890.34, AL355343.18, AC002996.1, AL121655.1, AC011442.5, AJ003147.1, AL021155.1, AC004089.25, AC006285.11.
HKMLK53	285	587269	1 - 1529	15 - 1543		AV719458, AI168335, AA694180, AA700192, AA779968, AW445200, AI367390, BE327620, BE465306, AI075829, BE815980, AA480872, AI435331, AA491269, AI753711, AA219131, AI493234, AI718133, BG109938, AL526433, AI952497, AI635921, AI370309, R49208, AW249915, AI204676, AW250053, AA449776, AW075396, AI337952, AI190404, AA700531, AI688030, AI004332, AA197329, AI879571, AI074890, AW572387, AI137248, AI355452, AW519052, AI478681, AI282138, AA102740, AI097219, AI609526, AW150814, AA973852, AW043962, AA227433, AI352182, AA516261, AW182467, AA079672, AW118786, AI609406, AA586497, AA151289, AA166704, AI149786, AA494521, AI153322, AI393847, AI160388, AI189817, AI152961, AA775355, AA494412, AA494431, AW591557, AA853974, AI520667, AA807464, AI159903, AW169570, AA922404, H04787, AI129464, AI359443, AW118816, BG011983, AI159903, AW169570, AA922404, H04787, AI129464, AI359443, AW118816, AI382986, N42954, AA907178, F11058, AI380119, AI926687, BG054937, AA577675, AA595867, AI144134, AU151041, AU151371, AU159367, AU145655, AU154404, AU150750, AU152612, AU159804, W72741, AU146474, AU150684, AU152823, BE302039, AU152431, BE302186, AI264916, AU152695, AU149949, AA599587, AW026884, AA626907, AI126630, AA581871, N70055, W94487, AA113220, AA938624, AI560420, AI870622, AU149957, AA226953, H97353, AU151073, AI097670, AI566990, F09549, AA610724, AA563737, AA974862, AW190045, AA669938, AU155526, AU150091, AU155518, AU155060, AA630115, AU150471, AW961280, AA191360, AI571896, R80426, AU154361, AI623459, AU156338, BE514913, AU150067, AA668477, N21455, R51577, AW969431, W31704, AA113390, BE673402, F04314, AW169427, AU156568, BG027127, T03630, AA858419, AU128655, BE889857, H17933, T40459, AA514726, F02328, AI491845, AI146488, AI864856, AU149654, BE244486, AI051351, AI922910, BF217017, T96369, BF196594, T65431, AI219701, BF541494, AU152028, AA599003, AA622745, AW593587, AW023946, BG032796, AI597830, AA214185, BF207819, AA088916, R49684, R74249, AA658944, BF576972, AI351009, AA132890, AA206322, AW149981, AA902464, AA205834, AI611206, R44358, AI865177, AI247836, BG115623, AA738215, AA888726, H05448, BF819090, AU149806, AW438971, R94411, AW875840, AW608777, AA668385, AA886478, AI969952, W95370, R45623, AA338507, R45342, BE871218, AI168677, AV655304, AA488788, AW369266, T80840, F35835, N90010, AL526392, AA776246, AA343900, AI934205, AA343877, W51983, AA319087, M77907, AW369292, H05148, AA527922, R72530, AV684723, AV685840, N83245, AA657347, AW747894, F27067, R06192, BF736297, AA824348, AW166672, AC008123.9, AK026166.1, M30938.1, X57500.1, J04977.1.
HKMLP68	286	1037919	1 - 2770	15 - 2784		AV700405, AI433307, AI478641, BF115123, AI566076, AI522321, AW272244, BE048940, AW771517, AV686299, AA931216, AI522047, BE048682, AW302179, BF593517, AI493025,

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	287	610018	1 - 1464	15 - 1478	<p>AF107258.1, AL022574.7, AC016543.6, AC005216.1, AC009518.7, AL118508.27, AJ003147.1, AC007938.1, AC006462.3, AC002080.1, AP000755.4, AL021395.16, AL132981.12, AL359854.8, AL161716.14, AL121755.23, AC005227.2, AP001677.1, AC078899.1, AC005901.1, AL356213.10, AC018840.3, AC006366.3, Z99290.1, AC010342.5, AC007277.2, AL389925.10, AC005386.1, AC010279.4, AL132641.3, AC008755.6, AE000658.1, AC009491.3, AL096772.5, AP000313.1, AC010148.13, AC008162.3, Z96074.4, AC007221.2, AL135961.4, AC009396.5, AL117338.15, AL137022.8, AL133173.19, AL121902.13, AP000194.1, AP001686.1, AP003113.1, AC006042.2, AL049715.25, AP001705.1, AC006606.5, AC024255.22, AL354864.16, AL445384.3, AC069262.24, AC017005.6, AC008178.3, AP002004.4, AP000684.4, AC008663.6, AL121977.11.</p>
HL2AC08	287	610018	1 - 1464	15 - 1478	<p>AL514822, AV716855, BE797339, BE889786, AW993482, BE778704, BE784148, AI064951, AW993281, AV649573, AW993282, BF030967, BG171338, BG253627, AW992854, BF339378, AV716022, BF699835, BF036931, AA670112, BF672645, BF214975, BF208494, BE567595, AA356542, BE003103, BG250954, AA356578, AA913737, AI909198, BG114769, AA353906, AA263131, AV736179, AW674899, AA732423, BE907740, AA356577, R79616, BF696689, BE080437, R34190, T72824, AA206943, BF209735, AA318503, BF700002, N78351, BF034898, BF340141, BF799849, BF210023, BE874285, AA471271, BE706224, BF034728, BE003256, AL080080.1, AB048246.1, AL591807.1, AC011290.3.</p>
HL2AG57	288	695733	1 - 1766	15 - 1780	<p>BE541697, AW955830, AI829139, AW264273, AW070588, AA872984, H06954, AI369038, AW134647, AA974445, AA902284, AI904699, H14753, BF110637, AW006498, AA970510, H06955, AW843696, AW885852, BF895113, AW243991, BF752088, AA306732, AW603435, AA333155.</p>
HLCND09	289	1172046	1 - 1970	15 - 1984	<p>AL524468, AL516965, BF341800, AU118258, AI832149, BF341727, BE910678, AU152725, AA253498, AA927669, AW136320, BF966942, AA284897, AI341987, AI375638, AI141878, AA410733, AA724418, AI656580, AA626359, AA633990, AA210941, AA480438, AI499844, AI498056, AW135997, AA595691, AA209463, AI804771, AI199374, AI278733, W52189, BG056386, BG056746, AA602519, AA253394, BF347961, AI189792, AI151483, AI242359, AI278938, AA456100, AI831279, BG036545, N51328, AA455603, BF841465, H22614, BG056059, R55869, AA496421, W96552, AA284720, T16865, BF341594, AI913942, AA904546, R55788, R90922, R87952, R79953, R25653, AW594694, T16864, AL524469, H20796, AI673432, BE262953, BF313400, AU130842, BE383565, AI954640, BE314810, BE262857, BE909511, BF929734, BE383513, BG036698, BE274853, AI631375, BE262592, AI380914, BF312256, BE262689, BF313886, BF530315, BE262731, BF315588, BF316121, BE277386, AW896204, AA969376, AI123164, T06607, BE262961, BG056600, R90921, AI355743, R27502, BF953012, AA338810, BE388421, R90911, BF954780, AW975618, AV718692, AV718489, AV742732, BG170993, AV724520, D51799, AW966053, AV699550, AW978634, C14429, AW966531, D80227, AV718800.</p>

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HLDBX13	290	815665	1 - 1801	15 - 1815	AI632044, BF871813, BF747135, AW630757, BF873312, BF770534, BF813448, AI608881, AA101562, BE792267, AI687737, BF771639, AA513370, C75490, BF848642, AW999404, AA861308, AA890390, AA486100, AW190875, C75621, AW339937, BE871109, AW338261, AI799264, AI193265, AA149993, AI469580, AW936241, AI925871, AI002582, AI955238, AI333843, AA486163, AI241578, AA702259, T86963, AI263270, BE350662, AI093487, H57108, BE934125, BF747862, BF807059, BF813934, R01692, AA837819, BF849699, BE927881, AW936086, AA714224, BF984148, BE927955, BF871808, AV725597, AI273968, BE386265, AV726550, AI350492, BF946044, AI633478, AW877520, AA342901, AW419262, BE063486, AI653886, AI761471, AA641989, AU147898, AW502975, BF998270, AL120483, AW903691, AI306524, AI312259, BF842579, AW405759, AC005899.1, AL355593.21, AC006026.2, AI003352.2, AC004491.1, AP000133.1, AP000211.1, AL163032.3, AC078962.30, AL163282.2, AC009756.9, AC010458.5, AL160471.5, AC008543.7, Y07848.1, AP000563.1, AL590762.1, AL031666.6, AC008498.3, AC009247.12, AC007666.12, AL049761.11, AC008982.5, AC022211.5, AC007850.29, AL136418.4, AL139054.1, AC020934.7, AC006126.1, AC024163.2, AP000692.1, AC005412.6, AL109804.41, AL354707.17, AL158830.17, AC010271.6, AP001630.1, AC006071.1, AC000052.16, AL137818.3, AC007216.2, AL035072.16, AP001711.1, AC005067.2, AC008891.7, AI009613.4, AC011559.3, AC022087.8, AC005193.2, AC010422.7, AC005324.1, AC003086.1, AL109627.18, AL109628.5, AC005632.2, AL031668.23, AL132640.4,

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HLDON23	291	636083	1 - 1248	15 - 1262	

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HLDOW79	292	847396	1 - 975	15 - 989	AA702685, AA470133, AI640188, AA442232, AA442756, AI566333, AI452429, AA442897, AW015092, BE222033, AA868769, AW300514, R01436, AA429745, AA705797, R00763, AA398423, H79642, BF087494, BG259284, AA252129, AI298508, AW272706, AA316913, AA705374, AW860285, BF913689, BE885241, AA641818, AA805708, N49165, AA665387, AL040011, AV682124, AI538564, BE047833, AW673679, BG028116, AI537643, AI564716, AI927233, AI954422, AA653252, AI494201, AA808175, AA746607, AL118781, AA693331, AL514093, AI570807, BF725644, AI633125, BF871314, AI582966, AW152182, AI537677, N71199, BE886291, AW079432, BF970652, AI096771, AW021091, AI829495, AV758806, BE974031, AA504514, BF836158, AI244105, AV656903, AI521799, AI884318, AW089275, BG107566, BF039003, BF812961, AI623662, AA928539, AW051088, BE048235, AW162118, AW020419, BE875959, AW160363, BF965053, AW088691, AI915291, AA888196, BG026969, BG105501, AI500061, AV682403, AI500588, BE047852, AL120853, AI623941, AI621341, AL041996, AI890214, AI254727, AW162194, AW022636, BF751288, AI365256, AI567128, BE876011, BG115134, AI886055, AW059568, AI859991, AV743129, AI669864, AA830596, AW088560, AI473536, BE790023, AI871703, AW167021, AI539260, BE906584, AI589428, AW327693, AA502794, AV757293, AI554516, AI433611, AL043070, AI345688, AI432030, AI150993, AI918408, BF525834, AI434731, AL046926, BG107834, AI698391, AI932794, AL036548, AI859240, AI702073, AI538850, AI699056, BG029086, AI473451, AI619820, BF997967, AI370623, AI889189, AI890907, AV682366, AI536685, AI824576, BG255493, AL514627, AI433157, AL513755, BF971001, AI274768, AW020095, BG113385, BF672397, AW080076, AL513901, AV746791, BF766529, BE786834, AV735890, BF055737, AV729336, BF814450, AW090071, BG113299, AA225339, F35882, AA732937, BF686473, AI540676, AI670009, BF814072, AW952456, BF038002, BF680133, AW880037, AI287862, BE881711, AI934259, AV703169, AI815232, AI678688, AA832154, BE909009, AW168705, AI811422, AI335411, AI910639, AI582932, AI872423, BE963954, BG117375, AI249389, AV727787, AI915295, AW004595, AI579901, AW827289, AI591310, AI521560, AI610667, AI514721, BE966699, AI690687, AI587489, AV681579, AI539560, AA834534, AI866469, AV734185, AW968336, AL042954, AI334445, BG164371, AW025943, AW079409, AA568405, BG027679, AI538829, AW198090, BG251435, AI783997, AI242246, AI522052, AI923989, AL048644, AW238688, AW083374, AI933992, BG252914, AI950877, BE966278, BF811804, AI440239, BF724894, AI887163, AI868204, AI738854, W74529, BE138941, AI471429, AI345417, AL513743, AI628331,



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HLDQC46	293	847397	1 - 618	15 - 632	AW274515, AA442374, AL522283, AI806931, AI928433, AI092561, AA628013, AI184518, AW262020, AW363180, AA729980, W92109, AL516443, AI436261, AA659720, AW340561, AI803297, AI802763, AA527556, AI186442, R77144, AW593087, AA953344, W91980, AI444603, R54966, AI799506, AI831001, F24469, AI934101, Z38258, AW451099, BE813043, AW956287, H00226, AI028279, AA649995, T35406, F35703, W23709, R71423, AA548429, AL530766, R77145, W35309, AL522284, N39838, AI940309, BF527253, H27628, BE896237, H44089, AF327923.1, AC006330. 5.
HLDQR62	294	753742	1 - 2558	15 - 2572	BE876197, AU133975, AW170131, AV723948, BG178057, AV652458, AW836234, AW608052, AA047046, BF104746, AA486037, BE395776, AW385580, AA488655, BE699041, AA932253, BG104619, BF671350, AA854943, AA418105, AA829456, AA243385, BE699051, BE936060, AI346694, AA418007, AA503398, AA053835, AW067836, AA878478, AI309218, BF820483, AA287990, W37960, AI401102, AI279485, W37900, AI423510, AA610711, AI050735, BF939011, BE699047, AA701403, W30974, AA017371, AW385388, AA911160, BF928600, H10281, W32542, AA133579, AV721259, H81907, BE908122, H11712, AA657490, H09562, R97956, BF810354, N68428, BF841567, AA018681, BF810349, AW838671, AW274397, BE699044, BF737894, H17436, AA133578, T03483, BF529092, BE699011, R93915, T84200, H10225, R97955, N91220, F09018, BE244933, BE697384, AW474873, Z43397, AA677745, F11358, AW838680, Z42508, H08994, H11779, R18755, AW067888, H86384, R20010, R44826, T78746, BE546845, BF768165, AA676360, Z41104, R12303, R61069, H80952, H01770, BF362799, AA857228, BE092626, AW361033, BE246721, R12953, F11514, AA298600, AA233314, H82000, Z45386, AA047038, AA988879, AA776420, R61792, BF925722, F02025, H37922, AA946813, AA058662, BE793798, AA298811, AW954042, AI024907, AA515707, AA579408, C02381, H38137, H80857, AA190438, AA059270, AW953912, W32541, AI253018, BF755527, AA252608, H39230, BF087406, BF841077, BE699066, F09175, AW608049, R36072, AW607934, AW242636, F02790, AA018740, BE092426, N47523, AW951415, BE872758, AA670010, BF793691, H86054, BE699208, AA017201, AA059226, BE857637, BG011131, AA233315, AW169463, BE935974, AA910836, BF756516, AA504287, AA489248, AW452612, BE858890, BE699076, AA953019, AA191764, BF930488, BE746764, AA552521, BF932022, BE080981, AW385586, BE092405, BE047109, AW838675, BE074538, AB046801.1, AC026749.5, AC026437.5, AC010491.3, AK001799.1, AF274753.1.
HLDQU79	295	740755	1 - 1474	15 - 1488	BG256275, BE867624, BE907396, BE855521, BF034422, BF530803, AW959247, BE782005, AI126689, AL121446, AA577065, AW630129, BF768037, BE746763, AA206154, AA460401, AI276320, BF998689, AA295243, BE242732, BG035901, AL040350, BE242810, T86168, BF983867, W05088, AA347337, BG252443, AI133502, AF064093. 1.

HLCRM43	296	846330	1 - 595	15 - 609	AA502331, AW444616, AA568450, AW592433, AA503839, AI017393, AW957011, T85589, T78178, T72043, T85588, AI699382, BF593574, AA299977, T86494, AW956056, AW605240, AA335186, AA551860.
HLDRP33	297	647430	1 - 598	15 - 612	AP000301.1, AP000045.1, AP000114.1, AC005080.2, AC004878.2, AP001717.1.
HLHFP03	298	460467	1 - 599	15 - 613	H46196, AI421986, HI9572, H46195, BF947135, H19490, BF738481, BF994257, BF127477, AW139949, BF947011, AF321824. 1.
HLHFR58	299	919888	1 - 1001	15 - 1015	R09539, AC020749, AC020749.
HLIBD68	300	778073	1 - 1008	15 - 1022	AL538046, BF975484, BG260893, BF062040, AW250850, AW954319, BG118275, AL633756, AL436560, BE646174, AA975057, AW302253, AI651397, AI825665, AI479926, AL635567, AI612806, AI640598, AI653427, AI248825, BF770160, AI333221, AA609320, AI916748, BF346659, AW001438, BF941021, AA397893, AI083783, AA399663, AA302889, AA484860, AI659648, BF222019, AI692578, RA9550, AW016187, AA393712, AI673346, D80738, D81106, D81495, D81643, C15479, AI696498, C15522, R42643, AI761655, AA302888, D81794, D81487, D60344, AA302884, AA302883, BF813253, AA091824, BE743563, NA9704, AI476597, D81533, N87760, BE396027, AA352126, AA281538, AA280240, AL133447. 1.
HLICQ90	301	791828	1 - 1752	15 - 1766	BF980403, BF726329, AI984197, AI192533, AI559494, AI378638, AA430026, AI061413, AW172705, BG165333, AI190915, AA430235, N62729, AI689890, AI360764, AA705532, H90333, H30177, T99745, H78217, T86019, H26993, T91236, AV645894, AA330598, N75483, H42449, BE766728, AW135351, AA976652, AA383620, BE220880, AI630095, BF381551, BF767606, BE087130, H42847, W05293, AA911697, AI659925, BE766726, H82733, T99746, BF899067, AW955970, AW971740, AI432644, AI431328, AI623302, AW968355, AI431347, AW972091, BE672759, AI432653, AI431230, AI432654, AI432655, AI431310, AI431312, AW081103, AI432677, AW968356, AI431323, AW972093, AW968729, AI431354, AI432661, BE672719, AI431307, AI431316, BE672732, AI431337, AI432650, BE672745, BE672748, AI431238, AI492519, AI432675, AI431350, AI431231, BE672767, AW972092, AI432651, AI432647, AI431243, AI431330, BF448552, BE672742, AI432662, AI431248, BE672644, AI432657, BE672774, AI432649, AW972090, AI91349, AI431257, AI432665, AI431247, AI431318, BE672738, BE672792, AI431235, AI431321, AI431315, AI431246, AI432643, BE672743, AL042519, BE672640, AW129223, AL042931, BE672622, BE672627, AI492510, AL042729, AL042832, AL047611, BE672754, BE672626, AL043295, AL357075.17, AF064854.1, AL133082. 1.
HLJBj61	302	1019012	1 - 1177	15 - 1191	AW872942, AW117752, AI890041, AI499326, AI567510, AW873006, AI674432, AW135420, BF436614, AI951906, AI627713, AW162140, AW246552, AW007045, BF057310, AI805899, BF940778, AI381032, AI536968, AA236566, BE218247, AI985613, AW172548, BG118309, BF591524, AI377422, BG222923, AA430628, AW172880, AA425276, AA804648, AA411475, AI123978, AA046462, AA972040, AA046463, AI498782, AA478421, AI277286, AW250887, AA402906, AA422065, AI198262, AW275810, AW149425, AA143775, AA436953, BE501551,

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HLMBO76	303	626831	1 - 801	15 - 815	
HLMCA59	304	519349	1 - 773	15 - 787	<p>             BF901960, AA847181, AI652197, AA513188, AW857239, BE179557, AC005952.1, AC011487.5, Z85986.1, AL445531.10, AC007688.15, AL137849.13, AL354707.17, AL023494.12, AC034198.6, Z93015.9, AL096712.20, AC012368.6, AF088219.1, AC009412.6, AC012476.8, AC016898.6, AC000025.2, AC007221.2, AC005527.3, AE000658.1, AL139316.5, AC005031.1, AC016772.8, AC073492.18, AP000501.1, AL162424.20, AC027319.5, AC000035.2, AC020947.6, AF001549.1, AC011236.8, AL121934.17, AL354864.16, AC073073.2, AC007193.1, AP000349.1, AC008745.6, AC010618.7, AC002301.1, AL158830.17, AL135839.15, AC034193.4, AL031670.6, AC006316.2, AC007541.9, AL121712.27, AC011489.6, AL353807.18, U95742.1, AC009487.3, AL360227.17, AC004771.1, AC018808.4, AL080242.11, AL050335.32, AL118501.22, AL049869.6, AC004840.3, AC011462.4, AL049636.22, AL021978.1, AC007216.2, AP003357.2, AC006349.3, AC002430.1, AC008592.4, AL121893.21, U80017.1, U91326.1, AC008757.5, AC068313.4, AP002852.3, AC005529.7, AF109907.1, AC003104.1, AL121845.20, AF031078.1, AC007384.3, AC007845.12, AC010679.6, AC044797.5, AC004890.2, AL135928.6, AC068533.7, AL390209.1, AC005231.2, AL355343.18, AL159191.4, AF030876.1, AL512347.14, AC020915. 6.           </p>
HLQBE09	305	520375	1 - 619	15 - 633	
HLQDH79	306	588446	1 - 899	15 - 913	<p>             AI742329, BF109853, AA778549, AI764973, AC005225. 2.              AA872059, AW411095, BE300619, BE794826, AA975640, BE300799, AI638144, AA912573, N90588, AA744906, AW410314, AW589332, AA644693, BE894434, BE300924, AA130580, AA877956, BF690513, AU146315, T48400, AI500242, AA114055, BF220201, AV704791, AA001913, AI066573, AI656724, AI862911, AW614509, BE537213, AA811293, C06211, AI368953, AA157714, BE208338, AI864913, AI804095, F31474, AA813756, AA281725, AU155115, F35906, AA053134, F21731, AW002359, H59426, AW168631, AA736779, AA310828, T70332, AI983296, AA470433, F27720, AW196440, R95681, AW410313, F24192, AA482345,           </p>

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HLQDR48	307	1307726	1 - 975	15 - 989	AUI21735, BE207855, R80991, AI872457, AU124448, AI206292, AA223534, AY029585.1, AK001691.1, AK024163.1, AC016673.5.
HLQEM64	308	1352374	1 - 760	15 - 774	BG003917, AI817406, BE545490, AW380189, AW161631, AW971418, AI732482, AI732481, AA506465, AA455434, AI791436, AA506457, AI791435, AA455961, AI805870, BG003913, BF889164, AW512931, AI791316, AI791270, BE892615, AA361022, T52193, BF091793, AA410873, AA376333, BE250549, BF149315, BE925340, AA410708, BE699783, AW890323, BE276496, N95142, AC008088.8, AC004702.1, AC006251.3, AC008569.6, AL132640.4, AC004707.1, Z98742.5, AP001717.1.
HLTAU74	309	853614	1 - 1510	15 - 1524	AUI19153, AU117938, AV763456, AI130859, AI130915, AI805438, AA846950, AA113301, BF674369, AL042853, BE264219, AV763971, AL119691, AL138455, AI334443, AW072923, AL048125, BE676900, AA508359, AL042753, BG231408, AW245747, AI284640, BG249643, AV760466, AA703891, BE277210, AA618452, BE253048, BF347791, AW946960, AL037683, AW303196, BF347740, BG112237, AV759518, BF914859, BF337291, AW301350, AL041690, AV764530, AV762098, AV762395, AA719292, AW852789, BF676991, AV682003, AA494038, AW168453, AV762959, BF677892, AI963514, AA468244, BF679819, BE393367, AL046409, BF676981, BE901529, BE409047, AI865213, BF687669, AA584082, AI281881, T40452.
HLTCO33	310	778074	1 - 1170	15 - 1184	AW862833, AA502104, AW274349, BF185701, AV759117, BF673914, AL046205, AW020992, AV763418, AA837050, BE276480, BF674620, BE160727, AA486106, AA837084, AV710066, AI334435, AA581903, BE138981, AV762050, AA629992, AW274346, AW082117, BF724372, AL043289, AV759935, AI754955, AV762645, AL121235, BE160516, BE297262, BE150580, AV760937, BF241967, BF928297, AW103509, AW407578, AA938225, BF304325, AA984263, AV761362, AI434695, AW341900, BF809583, AV735495, AW662543, AL038474, AA613232, AW276710, AA702729, BG060148, AI133164, AI583283, AL038705, AA584145, AA533333, BE350772, AW872676, AV755677, AA908687, AV742057, AI282511, AW270382, AW088846, BF915247, BF915628, AI469762, AA781975, AW833862, AA720702, AA493708, AW956640, AV710774, BF915722, BF679256, AW440545, AI368745, AV760039, BF812839, AA244357, AW023990, BF697673, AW995093, AW079659, AV763633, AA469451, BF991286, AA768247, AW872575, BE276880, AV761925, AW021583, BE274150, AW301809, BF475381, BG222267, AA775207, AV733830, AV763354, BE394054, AW419262, AA531372, AV763255, AW167799, BF690726, AV761786, BE252421, AI799642, BE049099, AA569661, AI457397, AV760378, AV735370, BF915839, AV718260, AL044940, BF792268, AI708009, AL042420, AW572729, AV759274, AW276435, AK021773.1, AB051111.1, AC022392.4, D83989.1, AP000244.1,

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HLTDV50	311	520231	1 - 756	15 - 770	AL449305.4, AL138724.12, AC008474.7, AC006040.3, Z68162.1, AC018828.3, AL359828.13, AC017016.5, AL139289.6, AC010654.8, X55927.1, AL022326.1, AC005164.1, AC005250.1, AL136984.20, AC011453.4, AC007226.3, AF129756.1, AC090950.1.
HLTEJ06	312	543017	1 - 603	15 - 617	AV712119, AV659712. AL525142, AW274273, BE327124, AI885095, AI885299, AA085210, AW340136, AI985381, AI369742, AW086489, BE298417, AI476470, AI039658, AI034384, AI333584, BE298210, AA455921, AI287650, AW592624, AA456390, AI266556, AI672315, R14963, BF688522, AI310815, AW962407, AA902537, AW954994, AV707146, AW960308, AW952064, AW960237, AW965813, AW963378, AW963660, AV703158, AW955713, AV727916, AW955616, AW951707, AV705433, AW954006, AV708850, AW960276, AW959059, AV709232, AW958280, AW966031, AW957853, AW953868, AW952011, AV658299, AI525316, AV661286, AW959983, AW953763, AW955152, AV704798, AW958796, AV705319, AV707329, AW949779, AV690209, AV707196, AV726026, AW952328, AV725709, AW952583, AW951551, AW955710, AV703620, AW965530, AW959858, AV709786, AW967182, AW952579, AW963752, AV653846, AW959721, AV707171, AW964112, AW965730, AW962924, AW953575, AV709555, AW960299, AV727272, AW955088, AW967184, AW962934, AW958088, AW965839, AW960676, AV706655, AW954209, AW960579, AW954407, AW960587, AV656373, AW961228, AW956010, AV706407, AV702120, AW965759, AV652528, AW960201, AV727787, AV706925, AW951549, AV658784, AV726203, AW959366, AW955161, AV709025, AV708438, AW956762, AW949351, AV708007, AV726142, AW956138, AW951301, AV701657, AW954003, AV707422, AV729160, AW951750, AV727003, AV726619, AV705171, AV726755, AW963010, AW963641, AV727377, AW954427, AV728642, AV729557, AV702868, AV727526, AV725090, AV659389, AW954116, AW954238, AW950197, AV659294, AW960779, AW953499, AW958859, AV654287, AW951768, AV705665, AV705143, AV702574, AW954411, AV709587, AW959312, AW951184, AW957779, AW960049, AV702851, AW952192, AW963354, AV699089, AV660608, AV645504, AW954225, AW952329, AV655280, AV708320, AW954266, AI535639, AW951882, AV709314, AW950446, AV691080, AV687946, AV652001, AV728997, AV725745, AV684604, AW962980, AV728590, AV726737, AV704740, AV709660, AV701613, AW955707, AV701844, AW963643, AW958936, AV705538, AV706741, AW958529, U94592.1, Z30183.1, U45328.1, AB005666.1.
HLTFA64	313	638242	1 - 1116	15 - 1130	AA703489, AW235215, W91995, AW361011, R99300, W91994, AA130677, H55848, T86395, AW051213, T86296, H55757, Z25051, AW579310, AC025754.4, AC016602.6.
HLTHG37	314	787530	1 - 3726	15 - 3740	AL521709, AU139605, AU133158, AU139786, BE535428, AV715927, AV707854, BE882531, AI433464, BE302408, AW612477, BG122886, BE220521, BF593222, AI186034, AW189879, AA480343, BE002782, BF675617, AI082537, BE002805, AI745058, AI379721, AA001791, AW118778, AU149758, AA001870, AI190938, AA017469, AI810133, AI580107, BF061454, AA017470, N75111, AW573126, BG119005, AA496528, AI361074, AU143997, AI421480,

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HLWAA17	315	629552	1 - 983	15 - 997	<p>             AL522002, BF305304, AL521608, BE732838, BE899550, BF344719, BG115015, BG109203,              BF982386, BE410162, BE735023, BE901175, BG117962, BE281306, BG165427, BF793440,              BE901577, BE872442, BF316646, BE409982, BF982251, BF970528, BE262711, BE299415,              BF340859, BE386152, BF569778, BE281612, BF305644, BG251248, BF673757, BF183244,              BE547252, AL521166, BF237978, BG249255, BE280374, BE301893, BG109330, BG164142,              AL522550, BE018945, BG170896, AW732476, BE779176, BE018944, AL532064, AW250139,              AA580387, H20615, BE741195, BE736037, BE272171, AI752100, BE870251, BE742694,              BE883834, Z42865, W21970, AA873793, AW579408, BF753347, AA204913, AA206511,              AA158660, BF971112, H66924, R25678, AA233944, BE743048, BE743976, BF304498, BE546682,              BG112068, BF317329, BE278514, BF878947, BE744899, Z25248, BG248593, AW675147, T56764,              AA368717, BE793472, AW956985, BE246887, BE298316, BE410692, BE707861, BF125052,              BE388318, BF970723, BF675911, BE868990, BF031826, AA380216, AJ771671.1, BC007886.1,              BC002563.1, AJ243649.1, BC003152.1, AF151829.1, AF132942.1, AJ243650.1,              AC004832.3, AC005585.1.           </p>
HLWAD77	316	653513	1 - 1153	15 - 1167	<p>             BG250493, BE786038, BF968793, AI148564, AV714668, AI911259, AV717040, BF031366,              BF970799, W60958, BE221213, AV701362, AI683823, AW268612, AV711084, AW275920,              BE551456, BE551386, BF244446, BE550880, BG110482, BF669035, AA404358, AW956755,              BE669452, BE504275, BE674209, AV763474, AA443743, BF381847, AI271616, AA936391,              AI675766, AV703458, AJ695003, AA403095, BF968311, AI311856, AI082141, BF036575,              BF575757, BE905833, AA503819, N30670, BF027805, T86418, AI079408, AA393808, AV711478,              BE872085, AA393892, AA827290, AI189388, AA910984, R21152, H96780, AW804422, AI014740,              AA804216, AV714823, AI219049, H23300, AI566294, R99539, BF724670, N75557, R99538.           </p>



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HLWAE11	317	783071	1 - 1604	15 - 1618	AI344312, AI276017, AI476822, AI139478, AI160906, AI240398, AW001088, AA425919, AA011278, AA428788, AI354692, AI089176, AA622689, BF431807, AI968918, N68826, AI467807, BF436247, AW673768, AW135943, R24434, R16812, R31419, R31434, R24435, H83155, AI865939, R31418, AW673133, W67349, R31433, AA027080, R28030, BE542160, T81223, AI631986, AA677315, BF760063, AI872675, BF331923, BE266682, BE926741, AF329842.1, Z82188. 2.
HLWAO22	318	587270	1 - 1324	15 - 1338	AL515814, AL515776, AL534165, AL520605, BF342613, AI064806, BF528629, BE856301, AI140344, AI763061, BF063934, BF244655, BF683133, AW340290, BF344711, AI659614, AL515777, BF034915, AI554886, AI086027, BE929854, AW193974, AL515815, AL525649, AA410368, AI937139, AA918821, AI218197, BF313091, AL525747, AA829365, AI336469, AW473975, AA577435, AV645326, AW070946, H22929, AA722774, AI610462, T90764, AA404313, AI623603, R54057, AV723824, AA404713, AW168607, AA079100, AV752738, BF316436, AW402756, AA912779, BE742923, AL534166, AA609213, BE350786, AA406191, AA923714, AW750290, AA325220, AW952354, BE898647, BF092248, AA293154, AI218895, AI198020, AI672973, BG002684, AA649195, W81523, H08723, AW207732, AA927962, AI873660, AA774521, BF880685, AL520606, BF837510, AW794716, BE044401, BF767735, AI383372, AI204653, AI361791, Z39695, BE673415, H70703, R54056, AI187740, H24109, AA079003, AI867628, AA330197, BF310103, BF854730, BE797091, BE737142, BF541812, AI689520, AW297870, BF965605, AW590611, H08439, BE263819, BF086702, F02166, BE347512, BF115405, AA477404, F04433, T83213, BF036962, BF767508, BE795356, AA430434, AW797192, AA479566, R16340, BF678079, BF685049, BF847264, BF847254, BF804160, BF847373, BE904852, R41416, BE312226, Z45578, BF733974, AA971991, W81639, AI902460, BF833057, BF804096, AI903581, BE798202, AA453110, Z42682, BF917644, AI564885, AA335484, AI811209, AW083638, BE260879, BF314999, BE274089, AI903535, AW376204, AI755186, AI880283, BE540368, AI523835, BG165048, AI627893, AW008226, AI440284, AI568293, AI559296, AI954721, AI446511, AI934011, AI364167, AI538564, AI744268, AI688858, AV750365, AI539800, AW129264, AI540179, AI364589, AI638644, AI690784, AI499570, AI590043, BE966550, AA659690, AI829432, AI932739, AI719817, AI500061, AI873604, AI479292, AI244360, AI141406, AI633125, AI620864, AI866040, AL515021, AI885982, AW081383, AI824746, AI620036, AI269469, AI270448, AI274655, AI884318, AI287252, AI678446, AI651840, AI890183, AI701097.

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HLWAY54	319	658702	1 - 1878	15 - 1892	
HLWBI63	320	566842	1 - 1024	15 - 1038	
HLWBY76	321	797609	1 - 2067	15 - 2081	
HLWCF05	322	460619	1 - 632	15 - 646	
HLYAC95	323	778075	1 - 298	15 - 312	
HLYAF80	324	460622	1 - 812	15 - 826	

					<p>AI815239, AI500659, BE883591, AI866465, BG167830, AI815232, AI801325, AI866691, AI500523, BF812438, AI538850, BE885490, AI877775, AI582932, AI284517, AI923989, AI872423, AI590043, AI500706, AI491776, AI445237, AI926593, AW151138, BF811804, AI289791, AI521560, AI889189, AI500662, AW151974, AI285417, AI623302, AW172723, AI539800, AI284509, AI582912, AI538851, AI440263, AI889168, AI927233, AW058275, AI866573, AI633493, AI434256, AI431323, AI866469, AI805769, AI434242, AI888661, AI500714, AI284513, AI888118, AI285439, AI436429, AI859991, AI889147, AI355779, AI623736, AW194509, AI581033, AI371228, AI798359, AI590024, AI491710, AI431307, AI440252, AI687588, AI440238, AI047422, AI567971, AI866786, AI860003, AI610557, AI431316, AI242736, AI828574, AI539260, AI887499, AW151979, AI539781, AI431238, AI537677, AI702065, AI539707, AI885949, AI285419, AI559957, AW089557, AI521571, AI469775, AI866581, AI567953, AI047398, AW074057, AI815150, AI446495, AI889191, AI952433, AI867068, AI225248, AI358271, AI698352, AI282249, AI371229, AI440260, AI474699, BE612681, AI687607, AI932620, AI890907, BF811802, AW129310, AI515185, AI866458, AI432644, BF815930, AI273179, AI499478, AI371251, AI866510, AI134524, BE897632, AI866461, AI923046, AW151132, AI049859, AI539771, AI048403, AI955221, AA878808, AI119511, AI513655, BF814072, AW151136, AI043152, AI273116, BG252929, AW858243, AI371237, AI561170, AI554821, BE895765, AI690946, AI469764, AI358612, BE877142, AW191003, AI648567, AI433157, AI433155, BF814447, AW081103, BE909406, AI538883, BG029667, AI801286, AI048375, AW021373, BF527274, AI867066, BG113493, BG260144, AI362495, BG110517, BG168696, AI371243, AI500683, AV736134, AA857847, BF892773, AV736402, BE963035, AI635331, AV743129, BE896091, BG257535, BF911528, BG033906, AI039390, BF795712, AI493559, BF796402, AI049850, AI045626, AW858522, AI274759, AI355008, BF036448, AI433976, BG254745, BE875243, BF726204, BE779152, BG169065, AA437293, AI049851, AI440236, AI282247, AI249936, AI963849, BE537531, AI539863, AI582910, AI040459, AI366900, AI537943, AI559976, BF814504, AW020095, AI366910, BG259737, AI521566, AA715307, AI513725, AI561177, AA809974, AW197139, BE618455, AI514283, AI250646, AI047611, BG113712, AI888022, AI512454.6, AI133391.5, AI138767.15, AI355795.13, AP001835.4, AI355136.19.</p>
HL YAN59	325	1352203	1 - 756	15 - 770	AI761381, AI738617, AA777274, C02420.
HL YAZ61	326	1352163	1 - 1223	15 - 1237	AV653286, AW591154, AV653266, AV757663, AF002986. 1.
HL YBD32	327	566657	1 - 1031	15 - 1045	AI290473, N36404, AI804254, AA321183, AA238620, AC073655. 26.
HMADS41	328	596831	1 - 1253	15 - 1267	BE740695, BE739906, BE899124, BE742745, BF685920, BF971897, BF684948, BE336652, BE747520, BE925550, AI733012, AI492192, BE207602, AW275042, AA954656, AW139807, AI791409, AW136444, AI361524, BE207644, AI762361, AI762373, AI246377, BF684146, AA306161, BF062047, BF222947, AW003832, BG028044, AA865078, AA402599, N32269, BC007725.1, AF123757.1, AF123758.1, AF123759.1, AF123760.1, AF123761. 1.

HMADU73	329	1352177	1 - 3180	15 - 3194	BE736177, BF968408, AW953455, BE513085, BE889654, BG248447, BE910370, BE311470, BE905308, BG163998, BE744228, BG167712, BG167766, BF219830, BG181007, AI141537, AW10963, BF183034, BE273660, AW150338, BE876928, BF205734, BG025353, BF220216, BE906937, BG024133, AW410964, BE784095, BE894840, BE787695, AI937321, AI291285, AA604680, BG035017, AI676225, AI416979, AA910937, BE273358, AI249741, AI126639, BE613036, AI601165, AA427563, AW068179, BF870292, AW997226, AI583536, AA039978, AA922852, AI042545, AI609947, AI870329, BE503809, BE244069, AI582686, BF334791, AI581661, AI268853, AA147194, AI335735, BE208847, AW190590, AI128471, AA536207, AI885712, AI419345, BE073411, AI246422, AI291867, AI917249, AW886428, BF436597, AW874025, BE247396, BF334812, BF334774, BF129143, AW303929, AI991848, BF334775, BE245324, AI423211, BF334783, AI031988, AA293156, AI972206, AA437330, AA076636, BF081258, AA427681, R73436, AI610274, AA102470, N47449, BF334781, AA427536, BF334779, N93816, AI951382, N47448, AI284267, BF968513, BF334797, BF334790, BF334816, BE789673, BF334813, BF334801, BF334776, AI349335, BF056321, BF334805, AI739283, AA627054, BF814698, AI338846, AW408759, BG034764, AA502274, BE890383, T08688, BE709083, AA659199, AA872138, AW191035, M62233, AI242832, AA040020, BF334773, BF844001, F24622, AI859689, AW191950, R73435, BF843212, AI215685, AA824249, N24016, BF733515, AW302387, AI766197, R85996, AW051539, AA766282, AI610976, AA477903, AA991453, AW068089, AA834378, W44967, AA488037, AI571263, BF436901, AA477255, AA732344, BF334770, AA962838, BF334769, AW471108, AW205834, AA456125, AA456126, AI311739, AA501748, R74553, AW966388, T08687, R72613, BF347017, AA284901, AW000739, AW131887, AA627957, AW001111, AI225064, AA284724, AA454679, BE300238, H42416, AI087082, AA235858, BF334795, AA487922, AW078845, R74250, AA625704, R72682, AA399145, R82789, AA394142, AA469296, T34972, AI261404, W90123, AI445249, AA368361, BF222642, BF905696, BE001794, AI469479, AA293648, AW192996, AI393983, BF334802, AI751338, AA102469, AL044292, AI382272, AA889433, AA295640, C01822, BF813657, BE242937, AI601166, AW956705, BE245918, AI343287, AI762717, BG015518, AI581968, T30468, R15816, BG058427, BE814656, AI744412, BE786532, C18456, BE672796, AI476060, AW068319, BG236882, AA112206, AW009377, AI424337, AI824385, BE729392, BF334806, BF334785, T32462, BE696554, AW361898, BC000424.1, AF131760.1, AL080164.1, AL133448.4, AF177336.1, AL110149.1.
HMAMI15	330	1352406	1 - 1244	15 - 1258	BE790239, AI114496, BE047613, AI609021, AI478544, AI949665, R96283, AI205799, W39248, AI670908, T70976, AA070919, AI243978, AW854183, AI796472, BF883407, AW975683, AA654405, AI125888, AA730911, AA545731, BE222003, AA730927, C21177, AA721678, AI478489, AL137139.9, AL139035. 27.
HMDAE65	331	520338	1 - 684	15 - 698	AL035447.6.

HMDAN54	332	411318	1 - 1842	15 - 1856	BF347321, AW960974, BF347309, BF347238, T78112, T23582, T31119, R19702, T23561, Z42020, R37848, Z38309, R44238, T06512.
HMDAQ29	333	600406	1 - 960	15 - 974	BF828645, AC007404.4, AP001064.1, AL158172.5, AL096700.14, AP001754.1, AC011446.6, AC021325.5, AC016968.24, AL008719.1, AL031729.16, AC008011.11, AC074295.7, AL157823.9.
HMEAI48	334	1352290	1 - 399	15 - 413	AA297104, AA298556, AA216561, AW957476, AL532709, AU124631, AA173361, AA206770, R14826, AL513976, BF726195, BF901681, AA873180, W20303, AF109127.1, AF109126.1.
HMECK83	335	636035	1 - 996	15 - 1010	AW070189, AA680237, AA577812, A732177, AA835854, BG223537, AL023494.12, AL158196.24, AC009102.9, AE006466.1, AL163248.2, AC003957.1, AC008537.5, AC022161.7, AL357315.14.
HMEED18	336	560775	1 - 1355	15 - 1369	BF967947, BF794640, BE744676, BE872383, BE261972, BF680443, BF967220, BE732377, AI417193, W95515, AW294641, BF306808, AI189166, BE856708, BE644954, AI949989, BF530795, AA628537, BE551422, BE747031, BE304795, BE735201, AI457735, BE870962, AI634510, BF131863, AI671536, BF242851, AI870629, AW514766, AI813311, AI862663, BE293244, AI768533, AI823596, AA129467, AI446582, AI435116, AI627345, AA972422, AI968606, AI088367, AI827354, BF439637, AI824877, BE220123, AV703921, AW236583, AI377591, AI040592, AA648774, AI095815, AW953613, D59730, D59523, AA029160, AW009152, AA054405, AI244209, AW023899, BE674038, BF059180, D59622, AA778356, AI470145, BF378975, AA970493, AI368877, D59801, AA129466, AI659586, AI344665, AI824866, AI803930, D59455, AA993837, D59633, R61441, AA704531, AW022576, AA484947, BF955158, D59447, AV725111, BE870487, AI082578, R35366, T74319, BF948389, D59583, D59781, R35909, AI365131, D59454, AW341984, BE467192, AI864239, D59649, D59777, H09254, T89104, AI128531, H23419, D59584, H09679, R23394, T77005, D59540, F13041, F10282, D80153, D80213, F10633, D59650, AA333625, BF855208, D59537, D59800, D59536, AI867775, AI702258, D80146, D59825, D59539, R25274, AA301260, D59438, H23420, D80341, D59769, D80323, AA827217, D59439, D59794, D59473, AA319561, R38088, R44178, R20566, D59692, F16283, D80260, R61396, D59749, AV726311, AA095729, D59772, AI088314, BF967226, AI383053, D59813, H22900, R14241, D59752, R40536, T34343, BF510049, F13475, D59782, AA346675, D80245, AI434889, Z43638, D59459, AW303981, D80381, BG054921, AW291373, D59812, AI418992, BF948033, AW516233, AI434666, BF837006, AW816352, AI356833, BF71676, AW340432, AA331587, AA332355, BF156021, AF353992.1, AK026257.1, BC008873.1, BC006150.1, AL512689.1.
HMEET96	337	566720	1 - 1323	15 - 1337	AL521371, BF337502, BG249151, BG113640, BG260630, AL521372, AL516032, AV731587, BE384522, BE973743, AI735261, BE563906, BE277846, AI808277, BF667795, BF691333, AW958349, BE871082, BF791366, BE389571, AW674769, BF691310, BF743166, BF211360, AI368797, BF572289, AA583057, BF664548, BE567499, AA807741, AI828551, W02860, AI088857, N44490, AW439214, AI026716, N73457, AI142511, N34764, AA633495, BF346426, AL512689.1.

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HMIAL37	338	603201	1 - 1406	15 - 1420	<p>AW934844, AL045824, AI269960, AW300030, AA860926, AI761354, AI739238, AW351654, AI984995, AW390711, BF931410, BE464037, BF229829, BE764327, AI628985, AI989344, AW013904, AI869919, AI121174, AI453367, AI270726, AI272081, AI869907, W22160, AW192301, BE463416, AI991419, AI796741, AA551799, AI738958, AI783811, AW304132, AA344913, BF229794, BF798430, AW843500, AW888833, BF798442, BE763828, BF761128, AA121198, BF333846, BF928080, AW062449, AA327309, BF800375, BF800393, AW845326, BF808207, BF819298, AB018687.1, AB006955.1, AF039700.1, AF039699.1, AC005137.1.</p>
HMIAP86	339	726831	1 - 1660	15 - 1674	<p>AL533220, BF967956, AL533253, AL520510, BE735407, BF972030, BE735149, BE615619, BE616472, AI873527, BF347687, BE383692, BF967233, BE385645, AW593348, AW381588, BF541528, AI032869, BE294015, AA404241, AI564151, BE294088, AA401224, AI682367, BF694848, BE255192, AA910774, AI367739, AW976142, BE615232, BE389860, BF029472, BE615138, BE645680, AI131262, AA054608, AI479085, BE728074, BF672705, AI241428, AA021119, AA142931, BG108596, AI039086, BF348256, AV748480, AA021118, AA056945, N48177, AI202193, AI491859, NS3324, AI364707, R44688, AA015735, AW015622, AA905989, AA813639, AA057005, AA035652, AA917010, AI952221, AA054548, AA015832, AA505774, AI697106, R19440, BE707409, BF841914, BE677828, AW954134, AW950006, AW954211, AI968179, AW960629, AW964070, AV728721, AV656478, AW953797, AV696931, AV683994, AV703878, AV702019, AV705014, AV728733, AV727510, AV706741, AV726026, AW952460, AV709596, AV709273, AV725633, AV706417, AW950443, AW959983, AW960655, AW960601, AW952403, AV702164, AV661704, AW952751, AW956075, AV645936, AV709587, AW955723, AV658084, AV692600, AV650315, AV659389, AV697880, AV727613, AV656373, AV726010, AV726091, AV660258, AV708109, AV647789, AW959521, AW956474, AV727787, AV659294, AV703146, AV726789, AV686060, AV692345, AV725745, AV660608, AV728148, AV726156, AV726590, AV709314, AV703790, AV653353, AV654070, AW964585, AV691080, AW951281, AV702385, AW949802, AV658275, AV652001, AW955662, AV707979, AV703669, AV727003.</p>

					AV709580, AV725208, AV658751, AV725582, AV708786, AV659547, AV727526, AV651920, AV725618, AW954439, AV684762, AV650283, AV702266, AV707088, AW963768, AV725776, AV650591, AV725577, AV725033, AV706223, AV728924, AV725617, AW954206, AW955900, AV707863, AV725991, AV650691, AV707304, AW952410, AV703062, AV726619, AV727822, AW951536, AV650768, AV699089, AV705135, AV701874, AW964410, AW962444, AV703501, AV661286, AV702772, AV962978, AW964440, AV702137, AW954237, AV707401, AV701183, AW955696, AV709660, AV704585, AV654035, AV709935, AV707652, AV707663, AV707654, AV704042, AV654282, AV709880, AV729220, AV697288, AV698290, AV694836, AV706882, AV704847, AV697498, AV702954, AV686420, AV727238, AV682997, AV696866, AV727126, AV707656, AV655890, AV701946, AV728997, AV706162, AV686390, AV705635, AV702794, AV686417, AV656256, AV695700, AV686083, AV698429, AV656240, AV655577, AV692972, AV694871, AV704217, AV727459, AV655901, AV689410, AV702790, AV705246, AV695545, AV687946, AV704924, AV728546, AV703762, AV706734, AV702854, AF078544.1, AF155811.1, AF155809.1, AF155810.1, AL035423.4, AJ010966.1, U94592.1, Z30183.1, AF217994.1, Y08991.1, U45328.1.
HMKCG09	340	548078	1 - 907	15 - 921	BE043082, AI927692, AW058564, AW055230, AW015122, BF592005, BF196476, AA814450, AI634533, AI139038, BF446797, AI277016, BE045365, AA732327, AI435146, AA290626, AA832487, AW964897, AV682305, W56110, AI796930, AI949631, R48833, AI800208, AI628443, BF431339, BF371245, AI935532, AI582596, AA319436, AA832489, T59460, AA806730, AA279760, AA325502, AI935529, C20681, T59406, AA766259, BF089238, AL035209.1.
HMMAH6 0	341	562776	1 - 808	15 - 822	AA736481, AI288032, AC004387.1, AC004031.1, AC002073.1, AC009137.6, AF001550.1, AL109628.5, AL121594.6, AL133215.16, AC024584.5, AC007688.15, AC005874.3, AF134471.1, AC002565.1, AC004678.1, AC003950.1, AC007546.5, AC002395.1, AC011529.3, AP002906.2, Z83826.12, AC009470.4, AC004703.1, AL050335.32, AL117354.12, AL136418.4, AL139054.1, AC005914.1, AL022313.1, AC002044.1, AC020633.3, AC018758.2, AC007279.4, AC013734.4, AC019205.4, AC005844.7, AL033519.42, AL035460.15, AC011484.4, AC020916.7, AF176815.1, AC007390.3, AC007371.16, AC009488.5, AL162615.13, AC006263.1, AC005156.1, U78027.1, AL031681.16, AC011491.5, AL136219.17, AC004383.1, AC002978.1, AC027319.5, AC018648.5, AC012476.8, AC055120.5, AL035422.12, AF031078.1, AL136218.26, AC008521.5, AC083871.2, AC074121.16, AL356915.19.
HMQDF12	342	566844	1 - 692	15 - 706	BE616124, BE616155, AW170508, BG009649, BF435220, AA573938, AW081928, AI961488, AA159477, BE292792, AI674909, AW572265, AI923587, AA636061, AW089967, AI457146, AI866782, AI888802, AI186201, BF739152, AI932621, AI379539, BE531047, BF689168, AI262916, AA934750, W60466, AI318103, AA588706, AI354896, AV656354, AW601821, BE744973, AW188567, AW970628, AW188566, AW079392, AA252902, AI472809, AW994447, BE042388, AI625947, AA552111, T97710, AA502830, BG259849, AW751488,

						BF737129, BG222333, BF737107, BG222571, BF916953, BE736954, AW117966, BE871206, AA715308, BE838489, BF835784, BF764625, AW291547, AW087246, A1682601, BF737124, AW074322, BE899333, A1824247, BF914747, BF836557, A1620321, BE672984, BF812178, BF772249, AW389752, BE827597, AW376365, AW362652, AA253308, AW794420, BF882777, U42408.1, U58994.1.
HMQDT36	343	1309723	1 - 1857	15 - 1871		BF793725, A1952777, BF314640, BF196065, A1346020, BE312722, AW024883, BF971029, BG256572, A1590661, A1046029, BF981514, AV705694, BF793937, BF667870, A1346915, BF126272, AW073186, AW237522, A1037668, AW151753, A1419538, AA399154, A1420960, AA971504, BE538264, A1424070, A1983928, A1858710, AW264165, BF183907, A1273879, A1970601, A1422333, AA610484, AA481014, AA758319, AA486535, BF366870, BF438573, BE566359, AA865664, AA528037, AW440638, A1804913, A1051129, A1094960, AA975822, AW367514, AA043942, A1337380, AA470886, AA450210, AA737971, BF666158, AA045559, AA292222, A1914093, BF126068, AA620519, AW022153, AA451613, AA551664, C17369, AA252687, BF130421, A1953410, A1359851, AW612052, AA045558, AA135778, A1037667, D58604, BF240003, AW402976, BF446878, A1423638, AA486630, A1189228, AW002772, BF739988, A1003695, R91050, A1261994, AV732944, BG178250, D63187, A1758843, AA728996, H02570, AV646278, BE078308, D78861, A1431974, T95753, AW954007, A1768841, AW369981, A1374732, AA503361, BF196783, AA298895, A1908249, AA962314, AW392006, AW392196, AW392074, BF375329, AV748933, BE349462, AW392085, H52318, AA296893, AV646289, W35300, N30487, AA303066, AW392190, AA031634, R76869, H03271, AW613552, BF087929, AW966074, AA298088, T95752, AW391941, A1864825, Z45938, AA135734, BF677085, N71976, T81251, T84519, AA296872, BF676832, AA041548, R76870, AA366382, C18136, R32692, H02653, T10828, H52227, C16129, R34136, BE896809, C17067, R23164, AW392168, R23163, A1687114, AA031753, R63893, AW392170, R06245, T99872, AW392082, AA890237, R99970, AW238952, BF081799, BF987204, A1719088, AA302997, AA365961, AA894778, AV740707, R06300, BE790444, R91051, BE073905, BF957298, AV739935, D20914, AA976000, W32904, AW937745, A1571626, AA719590, AW386001, BE827241, BF751340, BF752776, AA931929, R68979, AB011145.1, BC005374.1, AL137072.8.
HMSBX80	344	597448	1 - 1712	15 - 1726		A1400709, BE166317, AA635412, AA640681, BF822142, AW974947, A1919122, AW082490, A1469586, AL049715.25, AL445222.9, AC011495.6, AL137852.15, AC022217.5, AC011247.10, AC005077.5, AL096814.26, AL391139.19, AL358976.11, AC009123.6, U91323.1, AC009498.3, AC005255.1, AC003037.1, AC074121.16, AL358777.12, AC006509.15, AC005522.2, AF001549.1, AC007240.2, AL031727.42, AC022425.6, AL049569.13, AC011470.5, AC005015.2, AC022027.5, AC005377.2, AP003473.2, A1041815.7, AC008169.2, AL118520.26, AC008267.6, AP001922.4, AC084864.2, AC002476.1, Z85987.13, AL109976.23, AC010271.6, AC010609.6, AC008569.6, AP001718.1, AC004963.2, AL035088.1, AC090426.1, AC006270.1, AC006449.19,



					AP001711.1, AL009179.1, AC011465.4, AC020908.6, AC005072.2, AP000251.1, AC005071.2.
HMSFS21	345	545427	1 - 1269	15 - 1283	BF764928, AW959372, AW951170.
HMSG14	346	570833	1 - 1538	15 - 1552	BF355584, BF355571, BE160727, AL041690, AW502975, AV761155, AA587604, BF965007, BF475381, AW673241, AA631507, AW338086, BG222267, AL371070, AW406755, BF681427, AA652764, AL434695, AV728425, AV760777, AW969629, AI921476, AL042420, AW276435, BF919090, BF918590, AI246119, AI473943, AA503473, AL499938, AW965008, AI358229, AW503900, AA594145, AW162049, AW407578, AW995093, AI929531, AW008317, AV759204, AW936851, AV725423, AW021583, AL119984, BG171096, AA503258, AI357288, AI623898, AI830390, AV762645, AV725431, AI564454, AI623720, BE393367, BG178002, AV703682, AA502155, AW872676, AW103981, AA226153, AP001721.1, AP000125.1, AP000057.1, AP000172.1, AP000331.1, X90978.1, AP000330.1, AL139415.10, AC004067.1, AC019097.5, AC083884.6, AC011464.5, AL352978.6, Z84480.1, AC021016.4, AC024163.2, AC010553.6, U18395.1, AC005098.2, AL133382.8, AC009497.3, AC007003.4, AP001670.1, AL122001.32, M37551.1, AC022202.12, AC004816.1, AL136969.7, Z22650.1, AC009120.8, U57007.1, AL356481.16, AC006130.1, AC008171.3, AL157372.18, AC016903.3, AL035684.25, AJ009611.6, AC020928.6, AL450224.1, AL360230.20, AL445201.14, AC007240.2, AL023882.4, AL450226.1, AL049776.3, AC004694.1, AC004169.3, AC011455.6, AL031311.1, AC004031.1, AC006211.1, AP000432.4, AL160155.19, AC022493.12, AC004859.2, AC010329.3, AL109797.18, AC025264.16, AL353807.18, AC018495.4, AL356473.11, AC020663.1, AC004953.1, U47924.1, AC022405.5, AC004019.20, AC000052.16, AC011286.7, AC005245.1, AL137802.7, AL034379.8, AC010530.7, AC004638.1, AL109805.14, AL049830.3, AC009996.7, U62631.1, AL355497.14, AL121591.3, AL450265.11, AC010643.5, U66059.1, AC008102.17, AL390738.4, U91323.1, AC004206.1, AC026225.4, AC004650.1, AL158064.16, AL162426.20, AC005775.1, AE006467.1, AL121594.6, AC006205.7, AC006305.2, AC027239.5, AL357569.12, AJ006345.1, AP000514.1, AL357752.19, AL162233.14, U75931.1, AC090051.8, Z69666.1, AL022311.5, AC005523.1, AP001760.1, AC011479.6, AC005694.3, AB014080.1, AC010145.9, AC009358.6, AL161788.13, AP000044.1, AP000112.1, Z97200.1, AC026391.6, AC002476.1, AC007358.2, U12584.1, AC008720.6, AC000118.1, AL121903.13, AP000795.4, AC007050.25, AL133355.12, AC009228.4, AC006277.1, AC005740.1, AL163282.2, AC044797.5, AC007622.28, AC079177.21, AE006465.1, AC006275.1, AL589782.7, AK024174.1, AL390755.5, AC008760.6, AL158830.17, AC005527.3, AC010677.4, AC004987.2, AC009950.6, AL163973.1, AC007022.2, AC005079.6, AP001631.1, AC010150.3, AC007377.3, Y14768.1, AL158194.16, AC008745.6, AC008806.4, AL096792.5, AC006251.3, AP001716.1, AC005324.1, AC008519.4, AC005531.1, AL121964.16, AC006167.1, AC084865.2.

HMSGU01	347	1049069	1 - 1603	15 - 1617	<p>AC004455.1, AL590682.9, AC006372.2, AL355385.15, AC090883.1, AC068466.4, AL121983.13, AC007298.17, AL162729.8, AL121886.22, AC010342.5, AL357518.15, AL353764.9, AP001748.1, AC009477.4, AC008848.7, AC007488.15, AL391868.15, Z71187.1, AL354720.14, AC027332.4, AC009412.6, AC007099.3, AL161656.20, AL139809.16, AL031276.1, AC004485.1, AL031281.6, AC005295.1, AL590762.1, AL022328.21, AC013414.7.</p> <p>AUI23421, BF724895, BE990141, A1657485, AA305216, BE547088, BF569925, AW960660, AW960662, A1525907, R69944, R37909, AL532472, R84289, AA393390, AA904211, A1285493, AW013787, BE301610, AW081610, AA678932, AW769654, BE677244, AW272815, BE245576, A1719142, AW511778, A1792092, A1821056, A1821805, AA603264, R70883, A1915081, A1078409, AA610255, A1889995, AW969743, AW265688, AV764259, AA846923, A1797998, AW440568, AA482928, AA311599, A1280266, T74524, A1245693, AW151541, AL121287, AV720457, AA568204, AA570740, AA483606, AW963444, BF766654, AA523695, A1471691, A1791659, AW732103, AW020198, A1653999, H93152, A1859438, BG057207, BE062159, AA807704, AA584594, A1859906, BE155099, BF760573, A1457313, A1634187, BF917346, AW674631, AW069227, AA484892, AW572721, H02532, A1923052, AA683069, A1185394, BE892611, A1679045, A1709024, A1003391, BF857849, A1279417, AW403829, A1927275, A1038304, AW513727, AA573127, AA298365, BF855695, BE315483, A147414, AA493808, AW500684, A1249688, AA315361, A1984168, A160445, A1284045, AW078634, AA736488, BE501670, AW247338, H07953, AA612578, A1292236, AW188742, AA515048, BG029528, AA314338, BF917486, AA018105, A1348780, AW008169, AA314891, BF815810, A157093, AW962942, AW855527, BF854170, A1306731.1, AK023281.1, AK027567.1, AK001170.1, BC001241.1, AL358913.4, Z83826.12, AC025262.27, AL512666.6, AC011736.4, AC005476.4, AC004084.1, AC003025.1, AL157823.9, AC011485.6, AL049872.3, AC004079.1, AF139813.1, AL359813.23, AP002007.4, U80017.1, AL391259.15, AC006121.1, AL132712.4, AL139321.28, AC018638.5, AC008599.6, AC004985.2, AC022415.5, AL034549.19, AC007739.2, AC002364.1, AC005874.3, AF134471.1, AL035398.19, AL096818.9, AL031281.6, AC005756.1, AC020916.7, AC011452.6, AP000011.2, AC003690.1, AL139082.18, AL355336.15, AC005527.3, AC010271.6, AC005777.1, AC006435.7, AL161779.32, U91321.1, AC004099.1, AC006451.5, AC008124.8, AC011464.5, AL118511.25, AL139415.10, A1400877.1, AC009131.6, AC005288.1, AC083864.2, AC004020.1, AC002378.1, AL137792.11, AC020915.6, AC020552.4, AC008569.6, AC078841.4, AL161757.4, AC010150.3, AL356115.9, AL354864.16, AL354762.7, AC005077.5, AC011912.7, AC002470.17, Z82217.1, AC024093.46, AC006480.3, AC008623.4, AC007308.13, AC068724.7, AC007421.12, AF146367.1, AL033392.5, AF104455.1, AC010388.5, AC023114.5, AC008440.8, AC005786.1, AC009220.10, AL035562.14, AP000553.1, AC005907.1, AC009238.4, AC069208.24,</p>
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HMSHM14	348	461897	1 - 742	15 - 756	<p>AV701925, BF793477, AV652861, AV706319, BF733347, AV731015, AA649067, BF217767, AU116940, BG032917, BF811794, BF982391, AU120741, AL133602, BF871285, BF673583, BE620216, AL132952, BE250577, BE797641, AV652798, BF874267, BE883545, BF951636, BF877837, AL133895, BE898175, AU120778, AA577789, AW893125, AW962273, AA720812, AA225638, BE736918, BE153395, AA583363, A1926740, AA601152, BE563291, AA180390, AW845697, AW023095, BG009679, AW962826, BF871283, BF732306, BE616582, AA456928, BF803637, BE385152, AA553442, AA604116, AA503299, BE728115, BF763241, AA584599, AL568660, BF918672, AA808950, N62150, AL761174, AU147985, BF943073, AA418822, BE646483, AW845701, AA081957, A1084217, A1832080, BE379426, AA584606, BE615376, AA593381, AW593396, AA630813, N23657, AA487214, AA601086, AA309271, AA179694, BF755046, AA524729, AA631405, AV730261, AA703315, BE154390, AL052560, BF883829, N23646, AA826146, AA713998, A1940701, BF815608, AA584589, BE790104, AW087334.</p>
HMSHS36	349	1127691	1 - 1388	15 - 1402	

1238

					<p>AF117829.1, AB014082.1, AP000515.1, AC016617.5, AC007743.3, AL158823.11, AL356804.4, AC006979.2, Z99570.1, AL355540.12, AC002479.1, AC010629.6, AC011359.5, AC090497.2, AL139231.13, AL590043.7, U73465.1, AL359012.7, AF003529.1, AC005023.1, AL391358.14, AP001634.1, AC083870.2, AL356956.11, AL034410.8, AC023154.5, AL022401.1, AP001429.2, D83253.1, AL158819.14, AC079316.15, AL132825.35, AF216667.3, AF257497.3, AL161871.6, AC007444.1, AL160471.5, AL030995.1, AC069543.4, AL590034.10, AP000924.6, AP002788.3, AP002076.3, AL157815.12, AC005491.1, AL162388.8, AC008973.5, AL157791.4, AC008860.6, AC016612.5, AC079824.25, AC009196.13, AL133249.1, AC016716.6, AF128525.2, AC026116.26, AL050401.5, AC026445.4, AC009480.4, AC008407.4, AC090043.1, AL160234.2, AL137226.3, AL139165.1, AL158841.6, AC063979.4, AL354913.11, AC010523.6, AC007788.1, AC007065.5, AP001964.2, AL133480.9, AC006399.6, AL136110.17, AC025457.5, AL353643.10, AC012089.13, AC006565.4, AL022399.2, AC016689.3, AL034428.4, AC018712.5, AL033375.2, AL499610.10, AL121694.4, AL360272.23, AL356317.8, AL136309.8, AC079034.34, Z82203.1, AL049734.11, AC010368.4, AC022740.4, AC025447.4, AL136297.3, AL138479.4, AC004551.1, Z94056.1, AC008154.6, AC087879.8, AL137795.10, AC010201.18, AC018787.5, AC007256.5, AC008488.7, AL117339.10, AC008071.2, AL389895.3, BG111486, BE735498, BF668117, AW961166, AW451452, BE868441, AI040326, BF438495, AI650832, AW959882, BE857559, BF438494, BE219035, BF668359, BF697908, BE958065, AA313243, AI650393, AI818259, AA534633, AI033652, AI094737, AI693411, AI341518, W30723, AW197245, BE170654, AW051598, BE958204, AW938820, AW291994, AI274289, BE814871, AI221551, BE551765, AA035621, BG007999, AA653321, AA781232, AA634950, AA136077, N99062, BF431729, AW961161, BE669925, AW844472, BF668283, AA136161, AA722867, AA932876, AI659053, AA806117, AI474321, H87560, AA843369, AI435016, BE172432, H21542, AA361623, N47604, N45494, AI907694, AA332538, H87452, AA037342, AI284255, AA365059, AW797627, AW797609, BE074558, AW797590, BF827909, AW581248, AV742802, AV736824, AV762141, AV753828, AV762045, BF916188, AV760835, BG222151, BG223218, BF061262, BF941567, AA828594, AW516505, BE676909, AA577958, BF060915, BG222210, AW873282, AW275790, AW276788, BE094185, AA558345, AA654640, AV743295, AA558510, BE676942, AA557706, AA557822, AW207035, BG223416, AW265566, AA559325, AW238403, AA558026, AV739745, AV760038, BG223515, AA578392, BG222140, AA558224, BF478305, AA5578270, AA559188, BF958015, AW262059, BF478270, AA557769, AW270791, AA559277, AA569545, BG223580, BE085317, BG059176, AA559172, AA558170, AA507151, BG232125, AA627329, AV740217, AV701975, AA559340, BF941579, AA558286, AA548031, AA570788, AA502836, BG232137, BG230527, BG222163, AA577934, AA557810, AA595852, AA559288, BE085236, AA558019, BF885059, AA559233, AW963105, AA558045, AA578106,</p>
HMSJM65	350	633637	1 - 2256	15 - 2270	<p>AF117829.1, AB014082.1, AP000515.1, AC016617.5, AC007743.3, AL158823.11, AL356804.4, AC006979.2, Z99570.1, AL355540.12, AC002479.1, AC010629.6, AC011359.5, AC090497.2, AL139231.13, AL590043.7, U73465.1, AL359012.7, AF003529.1, AC005023.1, AL391358.14, AP001634.1, AC083870.2, AL356956.11, AL034410.8, AC023154.5, AL022401.1, AP001429.2, D83253.1, AL158819.14, AC079316.15, AL132825.35, AF216667.3, AF257497.3, AL161871.6, AC007444.1, AL160471.5, AL030995.1, AC069543.4, AL590034.10, AP000924.6, AP002788.3, AP002076.3, AL157815.12, AC005491.1, AL162388.8, AC008973.5, AL157791.4, AC008860.6, AC016612.5, AC079824.25, AC009196.13, AL133249.1, AC016716.6, AF128525.2, AC026116.26, AL050401.5, AC026445.4, AC009480.4, AC008407.4, AC090043.1, AL160234.2, AL137226.3, AL139165.1, AL158841.6, AC063979.4, AL354913.11, AC010523.6, AC007788.1, AC007065.5, AP001964.2, AL133480.9, AC006399.6, AL136110.17, AC025457.5, AL353643.10, AC012089.13, AC006565.4, AL022399.2, AC016689.3, AL034428.4, AC018712.5, AL033375.2, AL499610.10, AL121694.4, AL360272.23, AL356317.8, AL136309.8, AC079034.34, Z82203.1, AL049734.11, AC010368.4, AC022740.4, AC025447.4, AL136297.3, AL138479.4, AC004551.1, Z94056.1, AC008154.6, AC087879.8, AL137795.10, AC010201.18, AC018787.5, AC007256.5, AC008488.7, AL117339.10, AC008071.2, AL389895.3, BG111486, BE735498, BF668117, AW961166, AW451452, BE868441, AI040326, BF438495, AI650832, AW959882, BE857559, BF438494, BE219035, BF668359, BF697908, BE958065, AA313243, AI650393, AI818259, AA534633, AI033652, AI094737, AI693411, AI341518, W30723, AW197245, BE170654, AW051598, BE958204, AW938820, AW291994, AI274289, BE814871, AI221551, BE551765, AA035621, BG007999, AA653321, AA781232, AA634950, AA136077, N99062, BF431729, AW961161, BE669925, AW844472, BF668283, AA136161, AA722867, AA932876, AI659053, AA806117, AI474321, H87560, AA843369, AI435016, BE172432, H21542, AA361623, N47604, N45494, AI907694, AA332538, H87452, AA037342, AI284255, AA365059, AW797627, AW797609, BE074558, AW797590, BF827909, AW581248, AV742802, AV736824, AV762141, AV753828, AV762045, BF916188, AV760835, BG222151, BG223218, BF061262, BF941567, AA828594, AW516505, BE676909, AA577958, BF060915, BG222210, AW873282, AW275790, AW276788, BE094185, AA558345, AA654640, AV743295, AA558510, BE676942, AA557706, AA557822, AW207035, BG223416, AW265566, AA559325, AW238403, AA558026, AV739745, AV760038, BG223515, AA578392, BG222140, AA558224, BF478305, AA5578270, AA559188, BF958015, AW262059, BF478270, AA557769, AW270791, AA559277, AA569545, BG223580, BE085317, BG059176, AA559172, AA558170, AA507151, BG232125, AA627329, AV740217, AV701975, AA559340, BF941579, AA558286, AA548031, AA570788, AA502836, BG232137, BG230527, BG222163, AA577934, AA557810, AA595852, AA559288, BE085236, AA558019, BF885059, AA559233, AW963105, AA558045, AA578106,</p>
HMSJU68	351	427121	1 - 1109	15 - 1123	<p>AF117829.1, AB014082.1, AP000515.1, AC016617.5, AC007743.3, AL158823.11, AL356804.4, AC006979.2, Z99570.1, AL355540.12, AC002479.1, AC010629.6, AC011359.5, AC090497.2, AL139231.13, AL590043.7, U73465.1, AL359012.7, AF003529.1, AC005023.1, AL391358.14, AP001634.1, AC083870.2, AL356956.11, AL034410.8, AC023154.5, AL022401.1, AP001429.2, D83253.1, AL158819.14, AC079316.15, AL132825.35, AF216667.3, AF257497.3, AL161871.6, AC007444.1, AL160471.5, AL030995.1, AC069543.4, AL590034.10, AP000924.6, AP002788.3, AP002076.3, AL157815.12, AC005491.1, AL162388.8, AC008973.5, AL157791.4, AC008860.6, AC016612.5, AC079824.25, AC009196.13, AL133249.1, AC016716.6, AF128525.2, AC026116.26, AL050401.5, AC026445.4, AC009480.4, AC008407.4, AC090043.1, AL160234.2, AL137226.3, AL139165.1, AL158841.6, AC063979.4, AL354913.11, AC010523.6, AC007788.1, AC007065.5, AP001964.2, AL133480.9, AC006399.6, AL136110.17, AC025457.5, AL353643.10, AC012089.13, AC006565.4, AL022399.2, AC016689.3, AL034428.4, AC018712.5, AL033375.2, AL499610.10, AL121694.4, AL360272.23, AL356317.8, AL136309.8, AC079034.34, Z82203.1, AL049734.11, AC010368.4, AC022740.4, AC025447.4, AL136297.3, AL138479.4, AC004551.1, Z94056.1, AC008154.6, AC087879.8, AL137795.10, AC010201.18, AC018787.5, AC007256.5, AC008488.7, AL117339.10, AC008071.2, AL389895.3, BG111486, BE735498, BF668117, AW961166, AW451452, BE868441, AI040326, BF438495, AI650832, AW959882, BE857559, BF438494, BE219035, BF668359, BF697908, BE958065, AA313243, AI650393, AI818259, AA534633, AI033652, AI094737, AI693411, AI341518, W30723, AW197245, BE170654, AW051598, BE958204, AW938820, AW291994, AI274289, BE814871, AI221551, BE551765, AA035621, BG007999, AA653321, AA781232, AA634950, AA136077, N99062, BF431729, AW961161, BE669925, AW844472, BF668283, AA136161, AA722867, AA932876, AI659053, AA806117, AI474321, H87560, AA843369, AI435016, BE172432, H21542, AA361623, N47604, N45494, AI907694, AA332538, H87452, AA037342, AI284255, AA365059, AW797627, AW797609, BE074558, AW797590, BF827909, AW581248, AV742802, AV736824, AV762141, AV753828, AV762045, BF916188, AV760835, BG222151, BG223218, BF061262, BF941567, AA828594, AW516505, BE676909, AA577958, BF060915, BG222210, AW873282, AW275790, AW276788, BE094185, AA558345, AA654640, AV743295, AA558510, BE676942, AA557706, AA557822, AW207035, BG223416, AW265566, AA559325, AW238403, AA558026, AV739745, AV760038, BG223515, AA578392, BG222140, AA558224, BF478305, AA5578270, AA559188, BF958015, AW262059, BF478270, AA557769, AW270791, AA559277, AA569545, BG223580, BE085317, BG059176, AA559172, AA558170, AA507151, BG232125, AA627329, AV740217, AV701975, AA559340, BF941579, AA558286, AA548031, AA570788, AA502836, BG232137, BG230527, BG222163, AA577934, AA557810, AA595852, AA559288, BE085236, AA558019, BF885059, AA559233, AW963105, AA558045, AA578106,</p>

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HMSKC04	352	799540	1 - 1403	15 - 1417	<p>             BF843276, AA483606, H73550, AA570740, AV695478, A1623764, AW969743, A1342183, AA568204, A1369580, BF811714, BE315483, BG180976, BF804359, C75622, A1278089, C15060, AA829036, AW194325, AW161016, AL138182, AV763057, AC010191.24, AC004590.1, AL121586.31, AF168787.1, AP000046.1, AP001714.1, AL445686.14, AF222856.1, AF222854.1, AF222855.1, AP000104.1, AL138849.12, AL109758.2, AP001721.1, AL121758.24, AC008994.3, AP000512.1, AP001717.1, AL513008.14, AC018663.3, Z93017.6, AF042484.1, AJ003147.1, Z94056.1, AL118525.17, AC008738.6, AC011472.7, AL139342.7, AC005015.2, AC005756.1, AL355392.7, AC020906.6, AL136300.22, AC018755.3, AL512883.5, AC013429.12, AC004867.5, AL365445.11, AC005231.2, AC073347.3, AL391259.15, AJ400877.1, AC006236.1, AP001726.1, AL354720.14, AC005874.3, AF134471.1, AL136295.3, AL096840.25, U63630.3, AC069285.8, AC005295.1, AC004166.12, AC008753.8, AP001718.1, AL121845.20, AL136418.4, AL139054.1, AL049869.6, AC005049.2, AL049713.20, AC004150.8, AF002223.1, AC007938.1, AC010271.6, Z83844.5, AC079316.15, AL163281.2, AL157823.9, AC010530.7, AP000045.1, AP000113.1, AC007129.3, AC004228.2, AL158207.15, AL133163.2, AC011510.7, AC015801.25, AC010319.7, AC002544.1, U91326.1, AF307337.1, AC005971.5, AP000466.1, AC007374.6, AC002558.1, Z85987.13, AC008521.5, AC006238.1, AC005071.2, AL121771.17, AC006160.9, AC005940.3, AC004686.1, AC006040.3, AC013355.7, AC017033.5, AC005522.2, Z93241.11, AC011465.4, AF015416.1, AC005378.2, AC020552.4, Z99755.1, AL034549.19, AC090005.1, AC006965.3, AC011449.6, Z95113.2, AP001747.1, AL139035.27,           </p>

					AC007225.2, AP002852.3, AC009086.5, AC004024.2, AC004814.2, AC068319.4, AL132825.35, AL365444.11, AL163280.2, AF139813.1, AL356806.4, AP0000787.4, AC011461.4, AL049871.4, AC005291.1, Z95152.1, AP001711.1, AC069762.24, AL355385.15, AL136137.15, AC006121.1, AL031283.26, AC011484.4, AL355589.8, AP001754.1, AC072052.6, AC005914.1, AC004983.2, AL121897.32, AL049709.18, AL096791.12, AL050307.13, AL133215.16, AC008805.7, AL132772.14, AC084865.2, AF047825.1, AF111167.2, AC005747.1, AP001705.1, AC044797.5, AL158830.17, AL050331.11, AC005103.3, AC004953.1, AC004051.1, AP001712.1, AL049569.13, AL354873.19, AL031311.1, AC051619.7, AF124523.1, AP000665.5, AC011736.4, AE000658.1, AC004701.1, AC068799.14, AC003684.1, AL138743.5, AC009570.13, AP001745.1, AL022322.1, AC072061.8, AP000014.2, AC083866.2, AL137129.4, AL121594.6, AC011895.4, AL133246.2, AL031587.3, AC004963.2, AE006467.1, AL161937.13, AP002812.3, AL450104.14, AC004878.2, AL121827.33, AC090509.1, AF121897.2, AC008747.5, AC005668.1.
HMTAD67	353	588447	1 - 1159	15 - 1173	AV708544, AL538211, BG260284, AA115642, BF346567, AA443646, AW515082, BF525493, AI925283, AL636589, AW408580, AA454753, BG118083, AW957150, AW581689, BF346357, R38768, R42067, H29174, AA443581, T07288, F02778, AA115641, R44851, F02413, R60196, AI864300, Z45126, F06629, Z43368, F08742, BG179045, F02176, T26475, H29173, BE886101, F04026, BE062172, AI933455, Z44645, F05929, F05028, BE061823, R20034, AF052144.1, AB020683.2, AL133622.1, AC022517.1, AL049761.11, AC008397.7, AL133232.15, AC005529.7, Y18000.1, AC004882.2, AC011479.6, AC010412.7, AC009123.6, AC004534.1, AC009144.5, AL450325.5, AL132671.20, AC008757.5, AC002044.1, AJ003147.1, AC002117.1, AC005796.1, AC001228.1, AC005081.3, AC007664.12, AC007919.18, AC016830.5, AC016027.15, AL034405.16, AC002425.1, AC013449.8, AL356503.18, AL354735.14, AC004089.25, AC004876.2, AC005756.1.
HMUAP70	354	872208	1 - 1951	15 - 1965	BE613319, AV687447, AV725712, AV687625, BG166531, BE612728, BG114876, AV686519, AW952404, AV725638, AI061630, BE877777, BF055022, BF439548, BF692350, BF732575, BF967994, BG054984, AW372569, BE866270, AW160677, AV706186, BF690981, AA813278, BF206792, BE876393, BE645016, AV728247, BF195583, AI612729, BF446480, BF210620, AW167859, AW167862, AA521082, BF445077, BF698977, BE348758, AW753532, AA161332, BF665995, BF195330, AI806813, AI887683, AA843967, AA525839, AI869290, AA447934, AW068627, BE881059, AI912708, AA843171, AW206294, BF673423, AA402367, AA910679, AA037122, AI091239, AI422091, AA287736, AI816253, AI802199, BE042949, W56256, AW156905, AA779099, AI057601, BG168894, BE327200, AA781082, AA496466, AW022886, AW275342, AI091181, BE218417, AA873496, AI290167, AA992894, AI168731, N35917, BF028133, AI929639, AW003760, AA287895, AA774263, N22752, AA843277, BF001600, AI685261, AA283859, AI678620, AW403982, AA984140, AA056053, AA907413, AI361356,

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				AB055361.1, X53587.1, BC004530.1, AB060211.1, BC002523.1, BC007198.1, AL136780.1, BC008078.1, BC002844.1, AL136892.1, BC002733.1, AK027868.1, AK026532.1, AK026591.1, AK000652.1, AL122110.1, AB048913.1, AB048919.1, BC004951.1, AL050172.1, AB056420.1, AK026746.1, BC003682.1, AL133075.1, AK025524.1, AL133072.1, AK026462.1, AL133560.1, AB060912.1, AK024992.1, AK025967.1, AK026855.1, AB047623.1, BC004899.1, AB060897.1, AL117583.1, AB060863.1, AL117416.1, AL512733.1, AB060929.1, BC001964.1, AK025435.1, AB056809.1, AL137711.1, AB056372.1, AL162062.1, AK026627.1, BC002466.1, AF252872.1, AF274348.1, AK026927.1, AL023657.1, AF274347.1, AL157431.1, BC004264.1, AL137488.1, AL050155.1, AF056191.1, AL137292.1, BC003687.1, AK027114.1, AK026504.1, AL049300.1, AL049938.1, AB047878.1, AK026630.1, AL136792.1, AK027144.1, AL137558.1, AL512765.1, AL050024.1, AK024594.1, BC002365.1, BC006509.1, AL137705.1, AB062942.1, BC008899.1, AK026959.1, BC007456.1, AF202636.1, AB048974.1, AL136540.1, AL162006.1, BC004244.1, AL133014.1, AL359618.1, BC004215.1, BC003122.1, AL136805.1, AF207829.1, AF078844.1, AK027113.1, AL049460.1, AK000247.1, BC002839.1, AL137478.1, AK000323.1, AB063008.1, AK026762.1, AK026784.1, AL133077.1, AB053303.1, AL359601.1, Z37987.1, AB055368.1, AF090886.1, AB060887.1, BC003548.1, AK027142.1, AL137256.1, BC007346.1, AL080148.1, AL133619.1, AL050393.1, AL137548.1, AK027136.1, AL122121.1, AF285167.1, AL390167.1, AL359941.1, AL512750.1, BC008673.1, AK027096.1, AK026528.1, AF245044.1, AB063070.1, T54768, T63693, T91023, T84597, R13763, R18327, R20519, R25031, R43789, R53025, R20519, R43789, R55911, R81848, R81849, R90812, R90918, H53640, H53684, H86289, H97448, N25711, N43983, N59141, N75178, N76730, W31472, W31935, W35396, N89770, AA018416, AA019585, AA122341, AA565211, AA583521, AA613126, AA767024, AA807259, AA829478, AA831898, AA876196, AA906972, AA932624, AA953784, AA953789, AA975996, AI028021, N56132, C00677, R29165, AA092968, AA679878, AA782815, AA890689, AI042642, AI041151, AI093012, T24514, F02527, F04381, F04532, F08307, AI244846, AI276792, AI279043, AI298862, AI334644, AI348509, AI364763, AI202774, AI453449, AI400913, AI401566, AI417788, AI418178, AI498899, AI419614, AI582814, AI423417, AI127285, AI147786, AI148738, AI167754, AI187434, AI652739, AI219638.
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HMVBN46	355	626667	1 - 1368	15 - 1382
HMWEB0 2	356	638159	1 - 1741	15 - 1755

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HMWFO0 2	357	1352198	1 - 533	15 - 547	<p>AI801412, AL353701.15, AP000252.1, AP000121.1, AP00134.1, AP001711.1, AC005332.1, AC004967.3, AC005488.2, AC016387.7, AP000031.1, AC004166.12, AL133332.12, AC074121.16, AC004962.1, AC010422.7, AC069262.24, AC018808.4, AC004890.2, AC006088.1, AC034193.4, AC084729.2, AF139813.1, AL354864.16, AC007993.15, U78027.1, AC004228.2, AL121890.34.</p>
HMWGY1 0	358	825421	1 - 542	15 - 556	<p>AW851458, AV706796, BE799421, BF344271, BF797742, BG170149, BE018545, BF986660, BF986665, AA337372, AV646990, AV652826, AV697308, AV659190, AV687010, AV683488, AV686336, AV683233, AV689382, AI541524, AV652792, AV646944, AV711470, AV758785, AV761391, AV711130, AC004821.3, BC001202.1, BC000539.1, AF251039.1, AB029005.2, AF338242.1, AK025755.1.</p>
HMWGY6 5	359	1308287	1 - 1960	15 - 1974	<p>AW963001, BF059395, AW466899, BF590276, AI582610, AI281917, AI983184, BE501967, BF848401, BE219310, AI359514, AI582296, AI033082, AW594623, AW770514, AI088503, AI307166, AI818405, AW272259, AI143722, AW204164, AI590378, AI285806, AA004670, AI580084, AA904597, R51653, AW293660, AA968840, AA358991, AI278964, AW970496, AA836864, AA699611, BF003024, AA292694, T05806, R51562, AI935808, AW243480, AW243365, R14788, AV741332, F37583, AA365140, AI814209, BE842966, AA004251, AW103604, R40100, H46612, AI270512, AA092304, AI989617, R63257, AV734885, AL161751.2, AL450109.3.</p>
HNEAC05	360	519340	1 - 876	15 - 890	<p>BF095683, BF767062, AL121059, BE082604, AB011104.1, AP003473.2, AP001573.3.</p>

HNEEB45	361	1036397	1 - 1029	15 - 1043	AW007722, F08319, C14331, AW978633, D80132, AV718681, AW949655, L81855.1, AC003677.1, AC048330.20, AC018769.2, AL513342. 7.
HNFFC43	362	753337	1 - 2089	15 - 2103	AL048903, AI678076, BF527660, BE728354, BF317174, BE409263, AL530934, AL042801, BE792268, AL041340, AL530935, BE314879, AL042802, AW190561, BE313085, AI961484, AU154235, AU132769, AW027201, AI424792, AL524550, AA864499, AI432437, AA917094, AI934618, BE327057, BE383358, AI499074, AI344032, AI955647, BG253760, AA572961, AL048902, AW769938, BF509684, BE208853, AI342638, AI761488, AW732625, BE259667, AW974120, AI564533, W51904, AW961340, AI289643, AW971194, AW272378, BE297579, AI867205, AI796156, AA884306, BF002574, BF927739, BE885728, BF847648, AA456581, AA918441, AL524551, BF918942, AI766564, AW769937, AA493778, BF918936, AA304712, BF869582, AI168435, AU126961, AA298993, AA377693, AW769673, AI383037, H67555, AA322347, AA221032, AA713594, AI366484, AL039675, BE273248, F24965, AW797208, AA426295, AA322180, AA322590, BF919436, BF919453, BF919451, AW178871, AI538564, BF752997, AI766348, AI701097, AW080090, AI367680, BF812961, AI619820, AI633125, AI828682, AI818240, AW152182, BF811804, AI796113, BF968679, BF669151, AI800648, AI500714, AI702073, AI884318, AI590043, AI868680, BG122005, AA740450, AI866469, AI971615, AI345415, AI934259, AI570056, AI433157, AL046466, AI819545, AI499570, AI698391, AI440448, AI915291, AI434731, AI445829, AI889189, AI638644, AI370623, AW188525, AW008226, AI699823, T69241, AI635634, AW148363, AI818350, AW089844, AI686817, AI376425, AI609375, AW051088, AI744268, AV736995, BF970652, AI569637, AW163834, AI270295, BE393784, AI471282, AW075381, AL043355, AI872423, AI801460, AI620864, W74529, AI421252, BF812938, AW081236, AI581362, AL513817, AW193911, AI670009, AI871697, AI537261, AI950729, AV709679, AI651840, AI281757, AI619502, AI591387, AW168822, AI473536, AW196720, AI345612, AI620056, AW834282, AL046595, AI677796, AI582932, N21402, AI922266, AI500061, AI474646, AI345416, AW079409, AA641818, AI621341, AI702068, AW081383, AI633198, BF814761, AI619662, T49776, AI565172, AI696714, AV747571, AI524179, BF766531, AI366900, AI521560, BF925771, AI927233, AI536638, AI479292, AI564719, AW027898, AI419826, AI432969, AI432030, AI799183, AW238688, AI932966, AI354643, AW168788, AI401697, AI357940, AI890214, AW078712, AI250627, AI636507, AI357273, AI634345, AI579901, AI352497, AV711455, AW104724, AL514079, AI783825, AI612852, AI956080, AI524654, AW104827, AI445025, AI815232, AW198090, AI684244, AL513761, AW078606, AW083374, AA830709, AW192652, AK001356.1, AF260728.1, AL137599.1, AK001651.1, BC008337.1, AB033000.1, AF351620.1, AF183393.1, AL389935.1, BC003573.1, AK026408.1, AL117587.1, BC008591.1, AL080159.1, BC006103.1, AK026462.1, AL137530.1, BC002466.1, AK026744.1, AK026593.1, BC003101.1, AI133075.1, AL137537.1, BC005825.1, AK000418.1, AL136850.1, AL023657.1, BC001199.1, AK026389.1, BC004945.1, L19437.2, BC004349.1, AL122104.1, AL050149.1,

				AL389982.1, BC006181.1, BC001964.1, AB047878.1, BC002631.1, AL050138.1, AB050410.1, AB050421.1, BC006345.1, AK000414.1, S76508.1, BC008686.1, AF115392.1, AL389947.1, AF232009.1, AL050155.1, AL050366.1, AB050510.1, AK026464.1, AF131821.1, AK027144.1, AL137533.1, BC003658.1, AF245044.1, AB052176.1, AL137711.1, AF274348.1, AF274347.1, AL137480.1, BC002733.1, AL359941.1, AL133637.1, X82434.1, BC008364.1, AL080146.1, BC004925.1, AB060897.1, BC005168.1, AB056421.1, Z82022.1, BC002970.1, BC003590.1, AL353940.1, BC001844.1, BC004264.1, AL049452.1, AL117416.1, BC008717.1, AF132730.1, AB050431.1, AF090903.1, D83032.1, AK026633.1, AK025889.1, AL162083.1, AL137271.1, AF218006.1, BC003569.1, AK027204.1, BC004336.1, AL583915.1, BC001655.1, BC006287.1, X99971.1, AL080148.1, AL110280.1, AL137476.1, AF205073.1, BC008063.1, AB060916.1, X59812.1, BC003684.1, AL137292.1, AL133077.1, BC006487.1, AK027096.1, BC001785.1, AK027173.1, BC006410.1, S77771.1, Y14314.1, AL133062.1, AL050143.1, AF044323.1, AF195092.1, AY033593.1, X15132.1, BC003410.1, BC005678.1, AL080154.1, AK000636.1, AB055331.1, AF339775.1, AK025435.1, BC008037.1, BC006458.1, AL122100.1, U73682.1, AL133619.1, M85164.1, AF230496.1, AL442083.1, AL137574.1, AF285167.1, BC005002.1, AF169154.1, AF038847.1, AL136615.1, AK027095.1, AL162003.1, BC003056.1, AL390184.1, BC007571.1, AK025350.1, AL110221.1, AK024747.1, AF262032.1, AF106862.1, AL136805.1, AL133665.1, AK006288.1, AF002672.1, AK026556.1, BC004181.1, AL133084.1, BC002365.1, AK024992.1, BC007206.1, BC000550.1, BC006091.1, AB048913.1, AK026746.1, AL110158.1, AF184965.1, X78627.1, AB047627.1, AL133623.1, BC009294.1, AY034001.1, AK026532.1, AL162002.1, AF026816.2, BC000199.1, BC008649.1, BC003591.1, AJ299431.1, Y13350.1, AK025099.1, BC004362.1, BC007460.1, AL1512733.1, AB056420.1, BC008075.1, BC000090.1, AK025798.1, AF106697.1, AL136889.1, AL136893.1, AF199509.1, AF124728.1, U37359.1, AK025113.1, BC008078.1, BC004556.1, AF202636.1, D44497.1, AL133049.1, AF061573.2, AL157433.1, AL136784.1, BC008417.1, BC005070.1, AK026528.1, AL137478.1, X83544.1, AB060834.1, AL136844.1, AK000266.1, AL357195.1, AK027160.1, BC001305.1, AL137488.1, AL117435.1, X99226.1, BC004222.1, AL137550.1, AL161628.9, BC007021.1, Y14040.1, AF218000.1, AF141289.1, AK026613.1, AL117460.1, AF126488.1, AL080139.1, AK027365.1, AJ296345.1, AL137298.1, AL137716.1, Z35309.1, AL137627.1, AK000476.1, AK026550.1, AL359624.1, AL389939.1, AB048953.1, AL512684.1, BC000253.1, BC002370.1, BC002849.1, AF217987.1.
HNFGF20	363	768395	1 - 1356	15 - 1370
HNFFJF07	364	577013	1 - 602	15 - 616
				AA487061, AA486615, D78759, AC002091.1, AC004089.25, AC005015.2, AC039056.7, AC006329.5, AC005081.3, AC084693.2, U91323.1, AC002352.1, U82668.1, AL391259.15, AL109897.30.

HNFJH45	365	410107	1 - 561	15 - 575	AL512382.12.
HNGAK47	366	561488	1 - 1130	15 - 1144	AL390802.2.
HNGAP93	367	520227	1 - 689	15 - 703	AW064091, AC005344. 1.
HNGBC07	368	1037631	1 - 1635	15 - 1649	D80268, AW960553, D80212, D59859, AW966534, AW978661, AV720151, D80253, AV701839, AW952839, AV699447, AW958993, AW973490, AW959597, D59619, AW978634, D80210, D80240, D80366, D59889, AW959799, AV720878, D51423, AW966331, AW949656, D80439, D80219, D57483, AW973482, AW966059, AW966398, AW966342, AW966369, AW973474, AA305409, AW975613, AW966368, AW959136, AV718489, D80166, AW973445, AW964967, C14389, AV719557, AV720616, D51799, AV722801, AV719822, AW966053, AV718692, AW973307, AW973447, AV719324, AV718938, AV718633, AW975605, AW966378, AW975618, AV719913, AW950578, AV718707, AW973488, AW966386, AW960454, AV720211, AV718931, AV720729, AV720731, AW973334, AW966388, AW966397, AW949498, AV723927, AV699866, AW949642, AW973473, AW959202, D81030, D80391, D59787, AW966029, AV718440, AV720028, AW966075, AW966065, AW966022, AW964737, AW960465, D80188, AW966332, AW966399, AW966531, AW958992, AW956397, AV702451, AW966041, D58283, AW966333, AW966013, D59275, D80248, AW960483, D80038, AW962082, D80022, AW949586, C14331, D80024, AW966330, D80195, AW975621, AW978648, AW966385, D59467, D80247, AW959582, AV692290, AV654329, AV655880, AW965163, D80164, AW973541, AW966030, AW964488, AW949641, AV720791, AW952852, AW966054, AW949645, AV720203, AW964756, AW966050, AV719188, D80043, D80227, AW949657, AW966062, AV719783, D59502, AW959628, AW960473, AW965177, AW959570, AV719468, AV718800, AW965185, AW965197, AW965196, AW973485, AW965184, AV720104, AW965175, AW966400, AW962395, D80196, AV718844, AV720464, AV718770, AV720150, AW966380, AV700229, AV724520, AW959062, AW964477, AW956434, AV699550, AW949500, AW964468, AW949654, AW964532, AV699927, D80251, D59610, C14014, D51060, D51022, AV720533, D81026, D80269, AV726330, AW966032, D80133, D50979, AV750778, D80522, AW966343, D50995, AW973330, AW975623, AW949629, AW949653, AW949631, AW949643, AA514186, AW949618, AW949655, AW966329, D59927, D80157, AV719945, AA305578, C15076, AV718530, AV719632, AV718487, D59653, AV719049, AV723097, AW966043, AW965176, AW973465, AW961136, D80193, AW965158, AW962245, D80045, AW949633, AW959469, AW978642, AW966389, AW960532, AV721386, D51759, AW949646, AW949632, AW949658, AV702365, AA514188, D80302, D80241, AW360811, AW966377, D80378, AW752082, AW753053, AW177440, D51103, AV720035, AW950117, AV699652, AV699746, AW949630, AV700889, AW966023, AV720812, C06015, AV702035, AW966379, AW178893, AL022339.1, AL021937.1, AB028859.1, AF038696.1, AB002449.1, AF271371.1, X67155.2, D34614.1, AB038216.1, D88547.1, D50010.1, AL022339.
HNGBT31	369	408334	1 - 625	15 - 639	AA780406, AC003089.1, AC005367. 1.
HNGDJ72	370	532619	1 - 510	15 - 524	AC027689.10.

HNGDU40	371	597526	1 - 1021	15 - 1035	AA613157, C14389, D80043, C15076, D80045, AV718707, C14429, D59787, AV700229, C14014, AV719049, D59979, D59502, AV699669, AV719324, D51250, AV699866, D59467, AV701130, AV701149, AV742720, AW966053, AV719913, AW949656, D80166, D59619, D80210, D80391, D80240, AV723927, AV978634, D80212, AV720211, Z21582, D80196, AV718844, AW949642, AW975621, AV719468, AV744770, D81026, D80219, AV699447, AV719822, D81030, AV718692, AV701004, AW966531, D59859, D51423, AW973307, AW949655, AW949629, D51799, AW960553, D80253, D58283, AV718489, AW949631, AW949643, AV719557, AV720731, AV722801, D80195, D59889, D57483, D80188, AW949653, AV720034, AV719783, AW975618, AV720464, AW959202, AV718800, AV720203, AV719188, D80227, AV718770, AW966062, AV720028, AW959628, AW959570, AV724520, AV720150, D80193, AW965158, AV699550, AW966534, AV699927, AW966054, AW973447, D80949, AV699682, D80022, D59927, D80269, AV718440, AW949645, AW949657, D80038, AV700895, D80366, AV701123, AW959582, AV723097, AW965177, AV721386, AW966013, AW949641, AW949633, AW949632, AW949618, AV700622, AW966043, AV700889, AV720812, AW966050, D59275, AW978661, AW966041, AW949646, AV718681, AW949658, AV700159, D80024, T03269, AW959597, AW960414, C75259, AV718633, D50995, AW975605, AV720791, AW949654, D80378, AW964488, AW960465, AV720654, AV699746, D59610, AW965176, AV718931, AV701422, AW959799, AV742001, AV742667, AV701125, AV701335, AV701166, AV701043, AV701332, AV701017, AV701248, AV701431, AW964737, AV719628, AV745847, AW978648, AW973485, AW973541, D58253, AV645389, AV742048, AV645344, D80134, D80241, AW973488, AW966022, AV701419, AV701154, AV681510, AV681491, AV745853, AV700313, AV718938, AV701443, AV742430, AW752082, D80164, AW959136, AW959469, AV699479, AW962245, AW973334, F13647, AW964756, AV645343, AV720607, AV701344, AW958993, AW965163, D59695, AW966065, AW966029, AV743008, AV701151, AV720220, AW960564, AW958992, AV719000, AW959062, AW964477, AW956434, D51060, D80168, C14331, AV745080, AW973474, AW965184, AV719876, D81111, AV701428, AW965197, AV701415, C14227, AW956397, AW966059, AA305409, C14298, AV681529, AW973470, AV681468, AW966075, AV701021, AW965185, AW973330, AW960504, AW962082, AV721784, AW960454, AW965196, AW975613, AV723247, AV718530, AV720878, AW978633, AW966560, AW178893, AW965175, AW973482, AW975623, D80064, AW973465, AF271371.1, X67155.2, D34614.1, D88547.1, AF058696.1, AB028859.1, AB002449.1, D50010.1, AB038216.1, AB033111.1, U79457.1, AL009172.1.
	372	494246	1 - 646	15 - 660	
	373	532622	1 - 477	15 - 491	AW275971, AL369580, AW576034, AL353692.14, AC004638.1, AC027319.5, AC007011.1, AL354932.26, AK000932.1, AC074121.16, AC019171.4, AL390374.16, AJ400877.1, AL158830.17, AL109897.30, AC008403.6, AL121929.17, AC016025.12, AC002390.1, AL360227.17, AL049709.18, AL353777.18, AC004890.2, AC005098.2, AC005015.2,
	374	499076	1 - 1028	15 - 1042	
HNGEG08					
HNGEO29					
HNGEP09					

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HNGHR74	375	553443	1 - 1081	15 - 1095	
HNGIH43	376	410179	1 - 413	15 - 427	AC020644.6, AC018977, AL356243, AC018980, AC018980.
HNGIJ31	377	519120	1 - 782	15 - 796	AU147901, AA376128, BE562634, AC051619.7, AC020629.6, AL445553.10, AC009412.6, AC005052.2, AC079383.17, AL009172.1, AC016637.6, AK022380.1, AC004032.7, AP000555.1, AC009789.21, Z83851.17, AL359643.27, AC011005.7, AC008521.5, AC008635.6.
HNGIQ46	378	526651	1 - 513	15 - 527	BF960121, AA170832, AA585155, D53447, C14391, AV746334, AL541205, AV745704, AV758830, AW962651, AV755445, AV710906, AL546971, AV713182, AV717678, AV758166, AW950194, AL577808, AV762064, AV763339, AV646672, AV707414, AV756720, AV762898, AV761529, AV711001, AV759474, AV758483, AV763126, AV710831, AC006443.1.
HNGJES0	379	561568	1 - 1023	15 - 1037	
HNGJO57	380	579737	1 - 814	15 - 828	
HNGJP69	381	604891	1 - 971	15 - 985	AL041375, BF525663, H81406, AA599712, AL952574, AC008967.3, AL035407.15, AC007308.13, AC002470.17, AC008626.5, AC010458.5, AC007263.4, AC018809.4, AC002425.1, AE006464.1, AL121594.6, AL031005.1, AC004223.1, AC018642.6, AC009783.9, AC005037.2, AC007546.5, Z82208.1, U52112.1, AC008848.7, AC005079.6, AC006329.5, AC008760.6, AL136131.15, AL121588.24, AL121809.6, AC009229.5.

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HNGJT54	382	498272	1 - 1096	15 - 1110	
HNGOI12	383	1041375	1 - 2114	15 - 2128	
HNGOM56	384	836064	1 - 942	15 - 956	
HNHAH01	385	496115	1 - 891	15 - 905	
HNHCX60	386	520300	1 - 748	15 - 762	
HNHCY64	387	520294	1 - 711	15 - 725	
HNHCY94	388	520298	1 - 592	15 - 606	
HNHDW3	389	531908	1 - 779	15 - 793	
HNHDW4	390	410114	1 - 412	15 - 426	
HNHED17	391	1352204	1 - 829	15 - 843	
HNHEI42	392	985880	1 - 2628	15 - 2642	
HNHFO29	393	463568	1 - 685	15 - 699	



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				15 - 607	AI809098, AA758603, AA833679, AW371598, AW371593, AA524974, AC004216.1.
HNHFU32	394	562728	1 - 593	15 - 1355	AV700498, BG164166, AV700988, AV700545, AL037632, AV762783, BG260565, AV714931, AV760723, AF074667, BF792326, AF034176, BE796439, AW962035, AW976010, AA524604, AV760360, BE541237, AU118837, AV719941, BF678427, AL138265, AW188427, AV733710, AL048626, AU117926, BE909125, AV764490, AU119532, BE067011, AL534817, AV699709, AV686853, AV722030, BE393367, BE538259, AA708751, AT732911, BF346320, AW970915, AA526787, AW131249, AU147226, AV763174, AV760497, BF805173, BF968141, AV762900, AV759711, AV759356, AV760364, BF307044, AV762902, BF679169, AV759686, AV762779, AW963982, AL042906, AV759684, AV762001, AV759683, AL135377, AV734543, AW408643, AU155227, AV759046, AA601355, BF913258, BE273856, AL044340, AA081138, AI952885, AA584482, AV734401, AL042905, AV722075, AV737621, BF666736, AA211734, AW080062, AV762002, AV761309, AT791227, AW961160, AV763305, AI038990, AV759172, AW102955, AA708108, BF381650, BF828714, AI685198, AI679294, BE066950, AV763952, AA831913, AI679871, AU145521, AI204309, AW151713, AW069670, AA481760, BF892846, AW130036.
HNHOD46	395	843488	1 - 1341		

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HNHOG73	396	835026	1 - 788	15 - 802		AA584096, BF853760, AL137798.8, AL049569.13, AL137802.7.
HNTBL27	397	545534	1 - 777	15 - 791		AW169270, BF475369, AL524823, BE903984, AL530691, BE536833, BG230736, BE881512, BF033804, AA716162, AW183635, AL188277, AL141766, AL624087, AW173452, AL129419, AL683124, BE903838, AL828817, AL308087, BE544869, BF061917, AW291854, BE880241, AW471490, AW615124, AA701470, BF447518, AW025680, BF094269, AW449210, AA315210, BG251005, AW504333, AL239598, BE697836, BE742666, AL284846, AL355748, BE899398, BG027544, BF352604, AW376334, AW376337, AW752527, AW194025, AL890712, AL565340, BC006846.1.
HNTCE26	398	1160395	1 - 2149	15 - 2163		BG252201, AV726464, AL529709, BE894106, AV726994, BF970560, BF132059, BF977798, AL703275, AW512938, BG164577, AL529708, AL767521, AL823746, BE220262, AA583438, AL143608, AW468337, AL949854, AV727138, AL620344, AL209187, AL630993, BG007081, AL004986, AL565892, AL715169, AL367983, BF056815, AW394003, R70620, BG007658, AA152183, BF381743, AA565300, AA088574, AA931697, AA995899, AL025252, AA297479, T84083, AW138535, H71679, Z45535, AA297478, AL865989, AA367654, AA150060, AA044326, AW338484, D29436, R24591, AL005551, H00983, H39751, AL669105, T83438, BF091777, AW138127, R21165, BF083909, BE934286, R76620, AA971307, AA745052, AW945769, AL554153, T84151, BE550213, H01724, AW051517, AW373316, AW373313, T89390, BF083903, BE541509, AA180271, AL263504, AF303588.1, AF140242.1, AL133390.7, AF056032.1.
HNTNI01	399	1352285	1 - 2073	15 - 2087		AA447485, AA196688, M86015, AL750365, R13985, BF356780, N28763, AC005028.1.
HOAAC90	400	1301202	1 - 628	15 - 642		BF508077.
HOACB38	401	520201	1 - 592	15 - 606		AL439525, AA493464, AL348780, AA653139, AW502688, AA689351, AL887235, AL570067, AW813106, AC069262.24, AC007421.12, AL354735.14, AC004382.1, AC009131.6, AC090939.1, AP000359.1, Z86090.10, AP001748.1, AL049843.18, AL021391.2, AC015801.25, AL133243.1, AD000092.1, AL003147.1, AF243527.1, AC004125.1, AC007991.7, AL035086.12, AP001724.1, AC006038.2, AL121886.22, AL133448.4, AC007981.46, AC005207.1, AL359853.18, AC002477.1, AF205588.1, AC013429.12, AL121809.6, AC004980.4, AL229041.1, AC002430.1, AC011475.6, AC009123.6, AC008521.5, AC009506.5, AL139099.2, AF207550.1, AE000661.1, AC006141.2, AC010412.7, AC007899.3, AC005746.1, AP002360.4, AL359751.12, AC011811.42, AL158207.15, AC009144.5, AC007954.7, AL136179.15, AC000353.27, AC010319.7.

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HOCNF19	402	835049	1 - 1104	15 - 1118	F02459, Z17835, AL264655, BE011950, AV729096, N77968, BF807259, AA658839, AI076081, AW804948, BF987026, AC008078.11, AP002898.1, AL157369.7, AP002392.3, AC010999.6, AL353581.14, AC007383.4, AL133551.13, AL161659.17, AL132772.14, L81392.1, L81391.1, AC005317.1.
HODDN65	403	520348	1 - 741	15 - 755	BF526964, AV734149, AV760019, AL246796, BE063437, AL135377, AI061313, AA515048, AW274191, AI306232, AL046519, AI251576, AL248050, BF828714, AI311647, AW973992, BF826830, AI207465, AW505253, BF340002, AA303007, AW243793, AA704393, T05118, AI583466, AA504818, T74524, AW855643, AW468048, AA737309, AW732205, AL270177, BF821897, AV755654, AW504168, BG222813, AW965008, AI085242, AW516080, AW500684, AL079734, BE077105, AI380617, AI499954, BE062478, AW237905, AA806804, AA484201, BE148969, AV703187, AI612142, BF724699, AA513551, AA730305, AA515728, AW970940, AI491755, BE301584, AW963444, AI192440, AI053827, AV741663, AA524616, AA515723, AW975626, AA827383, AA678950, BF447461, AW963463, BE138594, AA484366, AI610941, AA829036, BF811714, AW407632, AA569089, AI583252, AA502532, AW502873, BF990660, AW969941, AL046471, BF821009, AC006111.3, AP000553.1, AC004644.1, AL162551.3, AL356481.16, AC005225.2, AC005484.2, AC026230.5, AL354889.14, AC006483.3, AC005229.1, AB044947.1, AL138759.20, AC008102.17, Z84468.1, AC010202.6, AL022311.5, L78810.1, AC004851.2, AL008725.1, AC015550.18, AL359092.14, AF006501.4, AP000075.1, AL022165.1, AC010326.6, AC007151.2, AL031685.18,

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HODDN02	404	422913	1 - 1925	15 - 1939	BG116781, BG110501, BE150456, AF742087, AA453725, AI917507, AW769479, AI860142,

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HODDO08	405	790333	1 - 1762	15 - 1776	<p>BF037067, BF690178, BF037467, BF690717, BE613160, BE262757, BF690612, AA878758, AA910686, BF691447, BF038260, BE613000, BG169000, AA863301, BF897824, AA401453, BE265475, AW339332, BF897816, AA565753, AA551055, A1093151, AA099024, AA699676, AA133969, AA471069, A1693843, BF036820, BF196905, A1911997, A1924160, BF815573, BF897801, A1360309, BF432589, A1813844, AA504750, A1686753, A1806115, A1261776, A1310423, BF940128, AW403869, BE742893, AA134035, AA070230, AW117201, AW026697, AW197588, AW338979, A1123979, BG112376, N98997, AW583508, AA582249, A1654526, BF477527, BE964777, AW628128, AA223526, AA171790, AA971846, H73796, AA171423, A1147095, AA070339, AA693726, AA983737, AA678212, AA070177, AW674690, BF573100, A1085327, AA132700, AW268656, A1923994, A1418621, A1278584, A1248228, AA504652, AA780169, H73783, AA292088, AA693704, AW957393, A1418336, A1740694, A1868945, AA292108, BF964464, AA132811, BE620176, AA100497, A1302064, BF573156, A1039893, A1219311, BE567691, A1192239, AW247578, A1289150, A1564731, H80411, R55471, AA975469, A1494533, AW044091, A1948639, AA863079, W24068, A1061079, BE313730, A1305164, H16101, A1630630, R21932, BF573651, BG057973, A1283354, A1003108, AW999148, H16102, A1268012, R55472, N67966, AA363605, BF691459, BF038622, A1383210, A1350432, A1698241, AA098910, A1122984, AA011640, A1452472, AA070149, H96713, AA046634, BF903467, BG105768, BF762692, N51622, AA303985, AW149938, AA405427, AA121746, AA484923, D20184, H17092, H73784, AA484823, AA379017, AA346687, BF809804, AA371365, AA121692, AA370670, AA248199, AA011641, R05554, D80913, AW884514, AW166740, AA664999, BE961160, AA294828, BF812313, H73797, H80412, BF798512, R22581, AA046773, BE858968, BE812881, BE775032, D53438, BF511095, BE812879, AA716159, BF038847, AA875914, Z20288, AA345058, R05449, BE789328, AW969365, AW499915, BE898856, BE762335, BE938247, AW956340, BF689788, BF933273, AV685029, AW999572, BE313283, BE962739, AW999933, BF753569,</p>

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HODDW4	406	579256	1 - 668	15 - 682		
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HODFN71	407	1194866	1 - 1112	15 - 1126		
HODGE68	408	834907	1 - 837	15 - 851		AW812930, AL741403, AI193921, AA292663, AW812933, AV707090, BF892766, AA528261, AA513570, BE152032, AW812788, AL139296.4, AL355886.4, AL512449.6, AL360179.8, AC005284.1, AC011246.6, D84394.1, AC034245.4, AC012361.10, AL133373.5, AC027287.20, AL078634.24, AC012039.10, AB020863.1, AL158064.16, AL138758.7, AC034240.4, AL121575.24, AC016045.8, AL157819.15.
HOEBK34	409	768325	1 - 733	15 - 747		BE463714, AI016683, AW779895, AA632933, BE180615, AL157827.17, AB011792.1.
HOEBZ89	410	828177	1 - 2506	15 - 2520		BF685342, BG110312, BF685502, BE070832, AW177053, BF815287, BE300677, AW239056, AW750775, BE303001, AW852115, T85313, AW751809, A1783820, AA362844, AW795506, AW377523, T85527, AI090377, AA809125, AW504667, AW813589, AA831426, BF840290, AA533066, AA313025, AI924950, AW963489, AI754421, BF964936, AC010087.3, AL391137.11, AC090051.8, AC026866.8, AC004453.1, AL035089.21, AP000014.2, AC004491.1, AC018926.10, AF196779.1, AC006251.3, AC005670.1, AC003025.1, AP001169.1, AF139813.1, AC008134.3, AP001729.1, AC004228.2, AC006324.3, AL049713.20, AC000120.1, AL163249.2, Z84466.1, AP000501.1, AC008812.7, AL158210.12, AC004701.1, AL139021.6, AL139035.27, AL035460.15, AC020655.10, AC067941.7, AC003015.1, AC006464.3, AC026787.4, AC007006.3, AC023472.4, AC005736.1, Z99716.4, AL157702.10, AL031678.2, AP001858.4, AC016397.5, AL135752.6, AC018832.4, AL133466.22, AC005863.1, AC005837.1, AL162390.9, AC016772.8, AC007344.3, AC016691.10, AC012499.7, AL139350.17, AE000658.1, AF130247.2, AC004849.1, AC019050.4, AC007620.30, AL161731.20, AL049830.3, AC018764.6, AC022468.5, Z97196.1, AP001574.3, AL034402.9, AL158040.13, AC010002.6, AC005288.1, Z97055.1, AC011485.6, AL161935.10, AL356575.8, AL163206.2, AC009756.9, AC021188.6, AL355612.8, AL049795.20, AC004953.1, AC007533.2, AL121586.31, AC019041.8, AC011495.6, AC006312.8, AC068466.4, AC009961.11, AL022576.1, AC012039.10, AC011455.6, AP002812.3, AL451086.6, AL390882.12, AL138758.7, AL139113.21, AL133367.4, AL109743.4, AC005730.1, AC026431.3, AL121582.19, AL117381.32, AC007679.4, AL513008.14, AL162426.20.
HOEDB32	411	634994	1 - 1448	15 - 1462		BE728085, BF525463, AL043598, BE379024, BE729709, BE388931, BF038202, BE389160, BF219910, AA937045, BE888648, BF983683, BF058514, BE729777, BE386542, BE270287, BF220144, BF732488, BF205132, N37022, AI806995, BE302761, AI218926, AI040017, AV700992, BF204637, AW269653, AW664365, BF851636, AA558441, AI971923, BE389935, AI971822,

					<p>AI984087, BF109553, BE149505, AI371806, BE466285, N63999, AI218921, BE896831, AW105333, AW264122, H97490, BF830445, AW410288, AW856197, AI041603, AW469216, N28797, BE379424, AW662759, AI218000, AI283819, AW789225, AA916425, W67366, AI354311, AW517796, AI343922, AA872912, BE207555, AW410287, AI751344, AI537028, AW379887, AI469495, N23215, AA305895, AV700726, AI399649, AW602751, AI857609, BF832669, BF738545, BF732356, AW960917, W67367, AI093054, AW132083, AA613324, AI220983, AW241183, AJ239424, AW876666, N32087, AI126987, AA722964, BF361409, AI312696, AI193728, H93764, W24695, H11009, AW876671, BF515670, AA166810, AI754948, AA166918, N93890, N93062, H92111, AI208255, AA994700, AA341436, AI043597, AI751345, T58592, R57961, BF929058, AI015141, AA375135, C01839, H14764, AW889983, D12283, BF755440, H06898, AI868297, AA594530, AA303707, AA535409, AA373071, AA885934, AA359174, AI280938, D83887, AW889975, N88528, BE673462, AA341295, BF088497, AA090357, H06857, BF512261, BC000526.1, AL117619.1, AF132000.1, AC003687.1, AL049873.3, AL450324.10.</p>
HOEDE28	412	1036480	1 - 1621	15 - 1635	<p>BC253644, BE617308, BE908205, BG168469, BE780471, BE962197, BE906067, BF995657, BE909860, AI807170, BF663899, BG119980, BF590292, AW245652, AI925873, AW369626, BE327306, AW835320, AI249748, BE222879, AA829645, N64725, AA921828, BF877027, AI858022, AI284125, AW188200, BF343620, BG058575, AW389738, AA308577, AI373933, AW058649, AA827526, AI480003, AI735476, AI088741, BF436493, AW897913, AI417852, AA494550, AW897907, AW338942, BF342403, AA994956, AA405790, AW514957, AI262527, AA494492, AI636409, AI434947, BE049371, BE905083, BG260598, T79610, AA962509, AW167441, AA405896, AW081192, D60231, AI278362, AI554143, AW188080, D81165, BE311649, H30174, AI243196, AA079581, AA740371, BG012145, AA972847, AI306626, AA593832, AW194277, AI351091, AA079481, AA034389, T53345, H28288, AA938450, AA293300, AI926625, BF993722, AA292019, AA258528, AI583396, AI276415, AA328961, H91077, AW363333, AW951949, BF992981, BF836627, H54397, BE041571, AW514433, BF945592, R97080, BF847325, H23972, BE302217, AW591181, R97126, BF945597, R75916, BE162162, AA704066, T53344, R48633, C06420, H91377, H15782, BF946082, N91739, AA323512, H54481, AA634725, AA366052, AI572758, BF943993, BF725666, H15781, AI863929, AI299302, BG010488, BE091179, C15317, BF992401, BE170194, AI783464, BF992478, AI985743, C15316, AA534183, AI918432, BE931309, D80793, AA767106, BF089135, AW879610, AI934252, BF089141, BF089154, BF089155, BF941774, AA258372, BG248087, AI383014, AW366744, AA034388, BE702368, AI364001, BF768284, AW601301, BG035284, AW997179, AW873693, BE706964, AW769571, AW245910, AW798864, BG253858, AK027083.1, AK026108.1, AB051532.1, AL390081.1, AL390080.1, AL390082.1, AK026133.1, AC058820, AC058820, BF349611, BE144240, BE144306, AW665086, BE908446, BE673358, BF437802, AI656054, AI741880, AW072783, AA670023, AW205477, AI453672, BF063715, AA603812, BE858966.</p>
HOEDH84	413	748236	1 - 2065	15 - 2079	



						AA885145, BF091278, A1766417, AA116081, AA043201, BF060900, BE937827, AA583974, AP000577. 4.
HOFMQ33	414	1184465	1 - 2396	15 - 2410		AL528504, AU121718, A1820674, T94707, AJ224741.1, Y13341.1, AC079145.3, AJ001047.1.
HOFMT75	415	911180	1 - 2117	15 - 2131		AL532142, BG260401, BF688316, BF796465, BE907259, BE878185, BF311180, BF182869, BF793219, BF528084, BG164901, BF025894, BF343463, BF027348, BE615276, BF339485, BG251657, BF340866, BE869513, BG168879, BF312304, BF344218, BG035574, BE909308, BF317451, BF346215, BF569244, BF569508, BF341893, BG164819, BG251015, BE876727, BE314260, AU119847, AW732268, AV691326, BF346288, BE907910, BE792057, BF314016, BE386414, BE787546, BF337708, BE384083, BF032872, BF308223, BF982476, BF313919, BF967499, BE272948, BE878890, BE272586, BE878055, BF853224, BE386215, BG035861, BF686718, BF569555, BE907675, AL036113, BE262510, BE261041, BG114738, BF315298, AU141949, BG171668, BE383392, BE906327, BF316184, BF846927, BE871813, BE780677, BE266551, BF316458, BE793972, BE870259, A1869324, BG171700, BG251535, BE302664, BE261412, BE905686, BF314291, BF528326, BE018644, BF846926, BF338012, BF344721, BE170034, BE797588, BF725914, BF313723, BE295702, BE539065, BE789580, BF526208, BE547474, AA433879, BF312413, BE735885, BE260798, BF724105, AW601604, BF724433, BE736776, BF314509, BE906884, AL526830, AW068684, BF312224, BF807244, BE890682, AL045190, BF344403, AW239170, BG165173, BE382506, BF872251, BE909949, AW630822, N20475, BF026564, BG178360, BE294687, BE867221, AW403966, BE392521, BE167525, BF985419, AW179034, BF872266, BF743019, AW239410, AW375966, BE277237, BE276165, BE276172, AW402407, BE543928, BE062186, BF378665, BF087437, BF880137, BE567147, BE938659, BE617502, AW067770, BF868761, BE336783, BE312715, AA057554, BG004418, BF985426, AW841776, BF851414, BF872268, AA410697, BE908992, BF883702, BE538481, AW884175, A1752785, BE542584, BG168264, BF883546, AW067904, AW068103, BE697629, BE697634, BF764898, BF870917, AW797744, R88501, AA074710, BE697637, BE717209, BF761588, H10878, BG164643, A1868439, AA603295, BF125971, A1751896, BF063288, BF846855, BG116325, BE174856, BF880542, BF304390, BE875185, A1909381, AW889411, BE796125, BF724712, R87863, BF817489, BG167275, BF380296, BF087740, BE006180, BF087690, BE075860, BE905813, AA852669, R88022, BF087652, BF087788, R87854, BF815395, BF354394, BE932097, F05545, BE707522, AW372168, M11233.1, X05344.1, M63138.1, M63135.1, M63136.1, BC008983.1, AK024538.1, AK026534.1, BC008382.1, AB056768.1, AK026592.1, AF090900.1, AK027204.1, AK026464.1, AK000432.1, BC004370.1, U39656.1, AB063008.1, AL080060.1, AL122098.1, AB063084.1, AL080127.1, AL136768.1, AK026452.1, AL390167.1, AF348209.1, AL353625.5, AF078844.1, AK027116.1, AL050393.1, AL512718.1, Z82022.1, AL080137.1, AK026551.1, AF271350.1, AL122121.1, BC005890.1, BC003687.1, BC006164.1, AK026045.1, BC004951.1, AF177336.1, AL117585.1, AL050108.1, AL136799.1, AL050138.1, AK026865.1, AL133104.1.

				AL512719.1, AK024524.1, AB056420.1, AF207829.1, AB063079.1, AL110221.1, AK024588.1, AK026542.1, AK000137.1, AL049464.1, AL359618.1, AL050277.1, BC004958.1, BC008387.1, AK025524.1, AK026532.1, BC008488.1, AL442072.1, AK000718.1, AK026408.1, AK000652.1, AL049466.1, BC009033.1, AK000647.1, AL389978.1, AF217966.1, AK026583.1, AK026642.1, AL049382.1, X69819.1, BC006807.1, BC001349.1, BC008485.1, BC007198.1, AF090901.1, AL133072.1, AL136787.1, AF104032.1, X72889.1, AF003737.1, BC008070.1, AK026480.1, AL512684.1, AL080159.1, AL133640.1, AB060883.1, BC005678.1, AK025958.1, AK000486.1, AK025092.1, BC001045.1, AL136915.1, AK025632.1, AL133016.1, AK025254.1, AK000323.1, AL157431.1, AF146568.1, AL133565.1, AB019565.1, AL136805.1, AL136864.1, AL162008.1, AL512733.1, AB060825.1, AL359615.1, AL359620.1, AL136928.1, AL359941.1, AB048964.1, AF218014.1, BC005168.1, AL080124.1, AB052191.1, BC003683.1, AK026947.1, AL133093.1, BC008417.1, AK026597.1, AK025414.1, S78214.1, AB060916.1, AL050146.1, AK026608.1, AB060852.1, AL162062.1, AF125948.1, AK026593.1, BC009341.1, AL136892.1, BC008280.1, A1012755.1, AL137556.1, AF090934.1, Y16645.1, AK026629.1, AF090943.1, AK026528.1, AL050024.1, BC002839.1, AL110196.1, AL512761.1, AB047615.1, AF225424.1, AL359596.1, AL050172.1, AB055366.1, AB060929.1, AL137538.1, AK027164.1, AK026630.1, AL136843.1, AB055303.1, AB060887.1, AK025312.1, BC003684.1, AK025772.1, AK025484.1, AL136586.1, U80742.1, AL137463.1, X65873.1, AF111112.1, AL389982.1, AL162002.1, AK025209.1, AK027113.1, AL122049.1, AK026086.1, AL122050.1, AK025906.1, AF162270.1, AB055374.1, AB050534.1, AL359583.1, AB056421.1, AL136844.1, AL512754.1, AL137271.1, AL512746.1, AB047801.1, AB062938.1, AL133557.1, AK025209.1, AL137271.1, AL512746.1, AB047801.1, AB062938.1, AL133014.1, BC008365.1, AL133075.1, Y14314.1, AB049758.1, AL096744.1, AL133077.1, AL133014.1, AB051158.1, AL133113.1, AL137527.1, BC006412.1, AF106862.1, BC006195.1, AB051158.1, AB055361.1, AK026855.1, AL389939.1, AL442082.1, AF183393.1, BC007021.1, AF125949.1, AB055315.1, BC007326.1, AK026533.1, AB060912.1, AL049452.1, AK026504.1, AK026526.1, BC005151.1, AB048953.1, AL137550.1, AB063070.1, AB047904.1, AB056427.1, AL049314.1, AL117583.1.
				BG252755, R14839, R14808, AL526882, H17173, BF361444, A1075929, BE883297, AC005754.1, AK024641.1, AF152500.1, AF217750.1, AC025436.2, AC005752.1, AC008688.7, AF152495.1, AF217756.1, AF152493.1, AF217744.1, AF217748.1, AF152489.1, AF152502.2, AF217749.1, AF152496.1, AF217755.1, AF152491.1, AF217746.1, AF152494.1, AF217742.1, AF152490.1, AF217747.1, AF282973.1, AF152497.1, AF217754.1, AF217757.1, AC074130.3, AB046841.1, AY013878.1, AF152501.2, AF152527.1, AF217751.1, AK027526.1, AF152498.1, AF217753.1, AL117449.1.
HOFNC14	416	1352378	1 - 2780	15 - 2794
HOFND85	417	847424	1 - 2034	15 - 2048

HOFNY91	418	847425	1 - 2392	15 - 2406	BC001186.1, AF152499.1, AF217752.1, AF152528.1, AF217743.1, AF152492.1, AF217745.1, AK021915.1, AK023190.1, AY013876.1, AF329369.1, AF131761.1, AL529530, BE896219, BE905006, BF701370, AV726968, BF697098, D56471, AA398982, D54791, AW952054, D54998, AA137223, D52957, AL529529, BF667411, AV722244, BE539516, AW603940, BG252620, R33682, D53702, AL537902, BG171582, AW752566, BE874188, R79409, BE891332, BE888598, BG180774, AA702285, D52438, AA306169, F00618, M78614, AW965817, BF515338, BF091420, AW847750, AA307191, AA446770, BE785930, AW157201, AW801965, BF031768, T31797, BF031629, AA658190, D52945, BE565940, AA157919, AA136378, AA150656, AW162647, AA282187, AL684319, BE540207, BF028795, H22397, AW847690, AW293605, AL457838, AA938423, T30493, BE878093, T30493, BG251689, BF341242, AW847685, BG169305, BF115649, BG166888, AV727838, BE739764, BF207904, BE738987, AV725549, AV726582, BE865924, BE866601, BE811512, BF028097, BF028440, AA155611, BF030153, AW070701, AA357234, D55509, BF028402, BF208666, BG054885, BF947687, AW997229, BE699329, BG164817, AV727582, AW750879, BG258115, BF446900, BG151519, BF001920, AW300512, AA639868, AA256021, W23904, BE866188, AI925691, R56031, AW379828, H08997, AI904379, AI632020, AW029553, AI950933, BG104880, AA828915, AI904416, AI986473, BF131266, BF588526, BF433181, AI125136, BF476107, AW770808, AA399621, AW801803, AI978599, AI700677, BE184726, BE184725, R35739, N52155, AB024334.1, AK024230.1, AC006388.3, AL537523, AL529922, AL531958, AL531931, AL533269, AL531527, AL538370, AL522567, AL533700, AL517522, AL533444, AL532715, AL533022, AL535485, AL537167, AL534487, AL533896, AL535844, AL531994, AL536379, AL532803, AL536823, AL533869, AL532035, AL532179, AL519275, BE740244, AL533860, AL515038, AL533553, AL5337985, AL532900, BF343282, AL533210, BF337581, AU117341, AL533099, BE746016, BF337686, BF792204, BF342077, BF525414, BF337225, BF526535, BF339813, BE746023, BF034576, BF725426, BF338260, BF530938, AL037604, BF526573, BF725182, BF526739, BF339663, BF347697, BF526503, BF525581, BF340234, BF338170, BF342084, BF343151, BE745055, BF530924, BF337272, BF343688, BF337021, BF970778, AL537984, BF341103, BF526677, BF338545, BF337395, BF342649, BF526859, BF340775, BF339935, BF526834, BF341477, BF344385, BF340877, BF342826, BF342633, BE736016, BF344578, BF525970, BF342467, BF343650, BF342924, BF340763, BF339538, BE544737, BE908437, BF341003, BF343078, AI207781, BF340051, BF525585, AL522566, BF338449, BE745373, BF337096, BF526010, BF341476, BF967360, BF338852, BF341124, BF338195, BF526745, BF342954, BF339763, BF979514, BE746698, BF339517, BF342360, BF340469, BF339191, BF339887, BF342928, BF341735, BF529338, BE743894, BE908818, BF525856, BF344911, BF338535, BF339332, AL532657, AL531957, BF344107, BF341131, AV723493, BF341782, BF344167, BF339580, BG109919, AW239295, BF528683, BF341918, BF344021, BF343832, BF337793, BF338946, BF338120, AL534486, BF338028, BF340384, BF344732, BF339317, BF341212, BF340817, BF340783,
HOFOC33	419	1186156	1 - 1655	15 - 1669	AL537523, AL529922, AL531958, AL531931, AL533269, AL531527, AL538370, AL522567, AL533700, AL517522, AL533444, AL532715, AL533022, AL535485, AL537167, AL534487, AL533896, AL535844, AL531994, AL536379, AL532803, AL536823, AL533869, AL532035, AL532179, AL519275, BE740244, AL533860, AL515038, AL533553, AL5337985, AL532900, BF343282, AL533210, BF337581, AU117341, AL533099, BE746016, BF337686, BF792204, BF342077, BF525414, BF337225, BF526535, BF339813, BE746023, BF034576, BF725426, BF338260, BF530938, AL037604, BF526573, BF725182, BF526739, BF339663, BF347697, BF526503, BF525581, BF340234, BF338170, BF342084, BF343151, BE745055, BF530924, BF337272, BF343688, BF337021, BF970778, AL537984, BF341103, BF526677, BF338545, BF337395, BF342649, BF526859, BF340775, BF339935, BF526834, BF341477, BF344385, BF340877, BF342826, BF342633, BE736016, BF344578, BF525970, BF342467, BF343650, BF342924, BF340763, BF339538, BE544737, BE908437, BF341003, BF343078, AI207781, BF340051, BF525585, AL522566, BF338449, BE745373, BF337096, BF526010, BF341476, BF967360, BF338852, BF341124, BF338195, BF526745, BF342954, BF339763, BF979514, BE746698, BF339517, BF342360, BF340469, BF339191, BF339887, BF342928, BF341735, BF529338, BE743894, BE908818, BF525856, BF344911, BF338535, BF339332, AL532657, AL531957, BF344107, BF341131, AV723493, BF341782, BF344167, BF339580, BG109919, AW239295, BF528683, BF341918, BF344021, BF343832, BF337793, BF338946, BF338120, AL534486, BF338028, BF340384, BF344732, BF339317, BF341212, BF340817, BF340783,

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HOGCK20	420	745445	1 - 2073	15 - 2087	AL517828, AL519145, AL531212, BE314599, AL527137, AL516077, AL521270, AL528374, AL517829, AL527760, BE410195, BF207279, BE894391, BE275383, BF344492, BE545217, BG116866, BE869193, BE910148, AL527158, BE905116, BE906070, BE539313, AL521271, BE544985, AW370647, AL080486, BE272322, AW129545, AW370565, AW370566, AW370569, AW370587, AW370585, AW370632, BF036759, BF111664, AW370635, BF036029, AV751399, AW370628, BF793770, BE161918, BE644987, BE513159, AL516078, AW952389, AA573800, AW361708, AW370597, BF793672, AW361545, AW370593, AI884757, BE905445, BE644790, AW370591, BG032275, BE545897, BF795549, BE781323, AW370583, AI751504, BE390637, AW370629, AW370626, BF307320, BF312112, BE616107, AW874541, AA599271, AA305125, BF305377, BF305746, BE304395, AI670082, BE548571, AI201054, AA044111, BF345456, AW387317, BF027143, AA410751, AW370645, AI979204, BE259925, AI687237, AW167891, BE385822, BE312740, AI828402, AI907591, AI819020, AW631188, BE298820, AA044057, AW103037, AA523198, BE298172, AA878137, AI754894, AI016005, AW662228, AI375007, AW130175, BF346901, BE388396, BF345509, AI690636, BE869078, AW440908, AW370586, AI907608, BF035998, BE293025, AI285110, BE139500, AI342760, AI862740, BE260090, BF761781, BF888238, AI028777, BF882332, BE877444, AA947042, AA032233, AW170149, BE893722, AW370624, AW273212, AI907602, BF310543, AA878164, BF763648, AI907600, AA618599, AA935855, AI074254, T69117, AI432547, AW370603, AI350390, AW510421, AA045976, BE737019, Z44367, AI613194, AA309604, AA846754, AW512536, T31182, BE615661, BE296557, AW370571, AI803040, C01877, AW516417, BE294829, AI241142, AA551200, AA506057, BF941946, AI805655, BF761823, BF083958, AI355466, AI751505, AA781304, BF875067, AA912801, AA620419, AA305077, Z40301, AW129402, AA806679, H83225, BE082695, BE263189, AI948632, BE938441, AW405902, AW370600, AL449482, AV693457,

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HOGCK63	421	895880	1 - 1395	15 - 1409	AL515915, AL519637, AL516502, AL530378, AL534341, AL527244, BF206279, BE563468, BE894600, BF528095, BE734337, BE261458, BE547607, BF207129, BE018805, BE258538, AA314355, BF966160, BE259017, AI878986, BF527510, AW961100, BF218016, BF805533, BE935456, BE273252, BE935565, BE379416, BF689497, BE615561, BF805135, BG250649, BF805538, BG111006, W00898, BE394407, BF805707, BE543852, BE935562, BE538668, BG012784, BE797749, BE870449, AA340663, AA337437, BF093795, BE617246, BE168598, BF827571, BF827568, H74337, H26577, R13677, H15188, BF827533, BE935468, BF920853, BF183200, BE617395, BG025917, BF769129, W52074, W00927, BE887136, N75733, BG253784, AA033549, BE938018, BF378489, BF531045, BE935512, AW389834, AW579752, BF984332, BE408926, N91321, T97551, AL530377, BF965806, BG112290, AL515914, BG104543, AW840975, AW840976, BG120271, BF808337, BE617147, BE174138, BF803235, N39949, BF852997, BF852999, AA037261, AA827575, T83003, N77103, BG178316, BF802890, BF980427, AW581002, BE311929, BE887785, BE892497, BE935460, BE935465, BF207193, AK027879.1, BC008732.1, BC001230.1, AF151835. 1.
HOGCS52	422	919898	1 - 2557	15 - 2571	AL530487, BE745421, BF530206, BE744240, BE732555, BE560832, BE728102, BE734494, BF340173, BE900928, BE899085, BG171027, BE407847, BF339012, BE391461, BE005931, BE387398, BE392364, AW962475, BF345275, BE269190, BE280532, BE870859, AI569503, BE392132, AL530895, BE908923, AA521235, BE295971, AW262804, AI264216, BE018918, BE890434, BE005979, BF961405, BF343159, BE715414, BE542338, BF792605, BE514659, AI636351, AI859499, AI744758, AA758222, BE675736, BF124910, AI126826, AW024550, BF530317, AA594600, AI567104, AI935268, BG149675, AW510761, AI280100, BG231713, AI363344, BE782378, BE245842, BF896674, N72581, AW082737, BF348228, AI291530, AI633705, AA483476, AI376854, AA862073, AI439117, AW360876, AA774640, BG006132, AI459751, BE504207, AW300087, AI673280, AI885032, AA405342, BE218474, BF896671, AI022088, AA788862, AW341140, AI168484, AA703032, AA631579, BF376297, AW026262, AA733166, AA878000, AA456364, AI693928, BE208332, AI377769, BE295604, T47288, AA393265, BF995787, H80493, AW261896, AA682322, AI189548, AW574867, AA224519, BE828754, BE828767, BG149772, AA523423, AA398668, AW264368, AW276800, AJ239429,

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HOHBB49	423	833080	1 - 3066	15 - 3080	<p>AW176451, AV763354, AV764307, AI284640, AV760937, AW193265, AV762111, AV764241, AL046409, AI963720, AI270117, AV710066, BF668217, AV759274, AV763255, AV761786, AV762139, AI281881, AV760571, AA577906, AL038705, AV740801, AW406447, AV761745, AI345654, AW270382, BE253048, AA483223, AA491814, AI431303, AA526787, AV762030, AV763971, AI334443, BF677892, AI801482, AF330238, AW419262, AA491284, AA468022, AW500125, AV762098, AV759382, AW274346, AI350211, BF347791, BF347740, AA610491, AV762395, AI613280, AW517377, AV761925, AW502975, BE394054, AA490183, AV763122, AW662543, AV735370, AI619997, BE150580, BE047069, AV761294, BE139146, AV759362, AL041690, BF475381, BE160727, AA523837, BF854876, AV759204, BF337291, BF915247, AI654525, AA581903, BE350772, W79504, AA623002, AW963497, AA610493, BF915628, AW503666, AW960468, AA584167, AI799642, AV762009, F36273, AI732863, AI355206, BF915722, AL121235, AV762826, AA533725, AL048925, AV760777, AW276827, AW438643, AW238278, BG249643, BF793766, AV763847, BF915839, AI061334, AW504669, AI821271, AV764578, AA503015, AA613203, AI499938, AI754658, AI561060, AW410400, AA469451, AV761362, AW273218, AA806796, BE672637, AW265393, AA101689, AV761106, AI754336, W47183, BG104686, AA780515, AV728632, BE350475, AI375710, AA493471, AA507824, AI811687, AV728928, AW473163, AV728425, AA613232, AA587604, AA653618, AW070892, AL044940, AW167372, BG059450, AI860013, AI149478, AL042420, AA446657, BF991286, AW072923, BF940837, AW956640, BF883982, AV759239, AW769399, AA630925, AV760704, AA525824, BF697673, AV725423, AI744995, AI085719, AA65021, AV761489, AV762154,</p>

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HOHBC68	424	603968	1 - 1823	15 - 1837	AW889450, BF799811, AW961831, AA309158, AA309202, BG005728, BF998803, AW888368, AI904188, AK000465.1, AB033025.1, AL109667.1.
HOHBY12	425	625973	1 - 1174	15 - 1188	AI566933, BF916217, BF991303, AB051431.1, AL022339.1, AL021937.1.
HOHCC74	426	547977	1 - 544	15 - 558	BF217791, AV747014, T66046, AA676735, FI2094, AL043886, T65277, AC018755.3, D50419.1.
HOHCH55	427	827481	1 - 2485	15 - 2499	AW967050, BF793252, AA150407, AI889756, AW068908, AI539422, AI189000, AA149419, AA047109, AW304902, AI750990, AI123024, AA317245, AI752854, AI095919, AI984090, AI679980, AJ954496, AA047265, BF749346, AW068311, AA136657, AA417383, AA446268, BE763257, AA136596, AA852682, BG222753, AA150286, AA417352, N52533, N52541, AA149305, AI129506, AA723730, BF987955, C01867, AA445992, BF928215, AF072752.1, AB008375.1, AL160153.11, AL355807.11, AL139800.10, AL359052.1.
HOSDJ25	428	854234	1 - 2200	15 - 2214	AL521533, BF966564, BG109192, BE621548, BG259805, BF666690, BF667661, BF185318, BF666019, BE621125, AL433432, AW963800, BE883279, BF028488, BF667980, BF196902, BF111775, BF667265, BF664922, BF966437, BF667218, AI277896, BF028500, AI401346, BF696865, BF698781, BG169528, BF696312, AW338135, AI280253, AA873621, AI435513, BE552077, BF699387, BF055949, BF697521, BE542555, AI277959, AA121788, AI961880, AW969937, BF478121, AW338124, AA528626, AW367010, R76478, AA101422, T62844, AI918990, BE167397, W72961, AA876737, R28131, BE176581, AA375127, BF332407, AI365181, W73131, T62693, W21429, N92911, BF570557, AI077290, AA127501, R66340, AI926197, C00153, AA813575, R28517, AI580500, AI222072, AI033269, AA758476, W86851, AV661704, AV725920, AV728997, AV704234, AV726624, AV655280, AV729378, AV708992, AV727787, AV709407, AV654908, AV660608, AV652001, AV656903, AV707541, AV706854, AV702117, AV726738, AV728733, AV708834, AV687035, AV697196, AV708704, AV659322, AV656478, AV698545, AV709314, AV708381, AV660728, AV691080, AV651955, AV703169, AV728518, AW952409, AV709660, AV729220, AV696866, AV726816, AV695545, AV656283, AV708025, AV707933, AV684604, AV708980, AV692691, AV701914, AV705159, AV702516, AV693523, AV726103.



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HOSEG51	429	545809	1 - 576	15 - 590	AA181348, AW968493, AI651957, BF593221, AU157244, AA459376, AI078788, AU144318, AI270699, AW605061, AI082584, AI522177, BE645867, AU149785, AA909435, AV716472, AW139763, N52810, AA610587, BE937915, AA765149, AW385335, BE709275, AA774278, AL538336, AK002014.1, AK021520.1, AK001369.1.
HOSEQ49	430	588824	1 - 1929	15 - 1943	AL527565, AL527566, AU127029, AV717222, BG178783, BG024682, AU135377, AI684606, BF213374, AI808517, AI760403, AV713586, AU145853, AI246638, AA868334, AI338877, AI635899, AW236318, AU145856, AI379001, AA744732, AU160233, AW976562, BF241216, AA837408, AA644572, AU149755, AU156835, AU136721, BF093289, AI751869, AI818657, AW340790, AA411104, AA406630, AI873361, AW513723, AI917960, AI751870, BE567743, BF246689, AA937127, N50672, N50727, AW072935, AU156004, AI242628, BE5958495, T96587, T96586, AA190825, BF029345, R64699, R64698, R79651, AA653804, AI830689, AA190434, AW362685, AI470390, AI219135, AA612712, R79844, C03923, BF238283, R35555, BE957997, AA484954, AA381771, AA411720, AI423860, BG150844, BE783490, AA484966, N50762, BF796600, BF590364, BC007014.1, AF070671.1, AC035144.3, AK001850.1, BC005352.1, AK001931.1, AF099935.1, AF099936.1, AF098934.1, AF098933.1, AC027320.5.
HOSFD58	431	614040	1 - 2513	15 - 2527	AL517202, AL517203, AW957146, BG116418, BF038478, AI563954, AU132232, AA932901, AI755091, AI831671, BE889854, AU127679, BE891799, AI582904, AI038368, BE246025, BG177748, BE906332, BE277910, BF982210, BE276343, AI633334, BE891988, AI954440, AI687563, BF984413, AW956931, AI565064, AI879207, AW778725, AI472032, AI924693, BF972236, BE889752, AV753606, BE536916, BE269039, BF196580, AA165526, AI248179, BF060729, BF308455, BE539211, AV734590, AA165570, AI219806, AI803270, BF027703, AI433120, AA780394, AW593783, AA305509, BE887807, BF032636, AA314159, AA745078,

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HOUQC17	432	429229	I - 4698	15 - 4712	AI810627, BF344199, BG056542, BG118486, AI126019, BE784908, AW954313, W07142, AA133346, BE047207, AV700629, AW163200, AI692832, BF589805, AW195344, AI755040, AW964293, AI890478, BE856510, BF370410, AW168050, AI985641, AI926525, AI369060, AI654583, AI571069, AU158513, AW167394, AI129429, BF244275, AW474740, AI887177, BF083290, AA993528, N91530, AI148739, BE925407, AW001362, AA022464, BF203604, AW194129, BF590332, AI144408, AI358849, AI342643, CI8560, AI089584, BE934752, AI128171, BF476695, AI889755, AA677116, AW613713, AW163724, AA011376, AI684137, AI953558, AI097021, AA029247, BF589929, W47316, AA129732, AI168616, N59612, H98678, AV725614, AI280406, AI160430, AW080654, AU156318, AA834490, AI368138, AW207161, AI690716, AA677837, AA031474, AW104712, AW474712, AI559164, AA662930, W92688, W35345, AA057170, BF759760, AI340202, AI569560, AI185000, AI199506, AA757215, N40523, AA151507, BF221465, R19976, W47201, AI769318, T86778, N95765, AA595069, AI128696, W92831, N29991, T95293, AA028027, AA903074, AA703651, W24878, AA918632, Z43925, AI027793, AA328867, AA634915, AW967361, AA846139, AW204001, AI537176, N27243, AI859558, BF437005, AI921704, AI040586, R13547, AI719476, H28325, AW630984, AI765271, AA987460, R76276, W23529, N36334, AI270245, H28326, AI160028, H27128, AA345812, AA368429, AA373718, AA011364, AI370696, AI537518, AA296523, H89564, R20636, T40492, AI827556, BF197787, AA807465, AL047040, T95373, AI686088, H89565, R20667, R76553,

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HOUDK26	433	565393	1 - 1037	15 - 1051	H20994, H45211, H45368, H40040, H45293, AU156903, H45192, AA205743, T24020, AW468607, T90417, AK001944.1, AF075043.1, AC02593.5, AC009299.5, AC005519.3, AC007954.7, AC004755.2, AL138837.12, AC005516.1, AI251863.1, AC010899.8, AC009410.3, AL049836.3, H30375.
HOUGG12	434	1352306	1 - 1881	15 - 1895	AL527278, BG178621, BE276463, BF970591, BE795657, BG164177, BG034560, AA065185, BE387525, AI588949, N50050, AI637496, BE895353, AI417226, AI416972, AA643564, BF205913, BE074117, AW131493, AI499213, AI762626, AI913183, BF515219, BE908464, AW386982, BF858300, AW387069, AI400651, AW104524, AI809424, AW451859, BF856861, AI279579, AI086975, AI199924, AV728965, AI086564, AW387004, AW608450, AW608452, AI300979, AW067812, BE818820, BF804306, AI699841, AI000010, BF915252, BF032755, AI381655, AA329513, W20329, BF895948, AA322018, AA451949, BF818735, T11886, BE143083, AW451003, N92712, AI804912, AA532451, AA478454, AW376737, AW848651, AW376690, AW578367, AW382902, AI249123, AW361740, AI056072, AA757383, AA621383, AI073711, BE083391, AA378454, BF804490, BF814894, AA600776, AI088985, AW376577, N54706, AA654012, AI199284, AI695495, BE927087, BG026437, BE888748, BF230035, AA884232, AW082620, AI127764, BG111270, AW196118, AW293470, AW410179, BG163964, AW881507, AA065184, AW376576, AW367070, AW394011, AF264781.1.
HOVCA92	435	527644	1 - 693	15 - 707	AW938534, BF963516, BF958753, BF956694, BF957465, BF362599, D38712, AC000385.1, AF061779.1, U73627.1.
HPASA81	436	1352382	1 - 1931	15 - 1945	AI417638, BG142227, BE047043, AI378918, AW968451, AA459131, W60474, D82310, W45474, AA367179, AF305835.1.
HPBCU51	437	411080	1 - 585	15 - 599	AA364901, AL526211, AV723053, AV722100, AL538154, BE255102, BE251465, BE257971, AU142823, AL535042, BE252516, AI589512, BE256907, AI142896, BC008763.1, BC000189.1, D82343.1.

HPDDC77	438	1306899	1 - 964	15 - 978	BF337609, AV745285, W56118, AA411082, BF031537, AA250775, BE813320, AA862532, AA862534, BF669016, AA505270, BF130828, T32131, AA372427, BF696363, BF028658, AW518578, BF030194, BF131517, BE179443, BF030661, AW630420, AW900594, AI267426, BF381745, AA236139, AA318983, AA164404, AL534009, AL047026, BF095360, T07060, AW891586, BF541413, BG168343, BF928857, R79561, BE380028, R33720, C01622, Z24914, AW746413, AV752615, BE708396, BF910231, BE925952, BF540973, R36171, D54233, AW818345, AB037797.1, AK025028.1, AK026917.1, AF250324.1, AC079801.2.
HPDW28	439	1094609	1 - 514	15 - 528	AI394037, AW303979, AW293101, AI827868, AA010190, BF001923, AW006972, AI809548, AW138946, BF476527, BF084139, AK025743.1, AP000067.1, AP000067, AP000067.
HPFCL43	440	535710	1 - 651	15 - 665	BF976224, AV729127, AA837404, AV729103, BG055177, AW169122, AI796276, AA603456, AV729600, BF447152, BF059491, AW196971, AI566470, AI636657, AA279066, AA845528, BE219765, AV725215, AV725488, AA046476, AI025283, BF663369, BE379318, AA936074, AA031332, BF003040, BE467269, BE270829, BG060181, AA568448, AV727986, BE271012, AI351514, AW470751, AA878870, AA026888, BE879122, AA015966, AA632383, AI090910, H20001, AA150301, AV725538, AW236006, AA625391, AV704013, BE737339, AI358381, AI476276, AI718051, AV728067, BE561457, AL048514, BF105823, AV756946, AV758524, BF576620, AA455061, AW955472, AI337508, AA026657, AI468881, AI559878, AA090696, AA455761, BF132919, BF790637, AW062362, AW149768, AA743298, AA47922, AA031331, BE839021, BG104864, AA446847, AA148792, AV702908, AV712537, AI370062, BC007349.1, AF151895.1, AF110777.1, AC007241.3, AC007742.4.
HPFDG48	441	542227	1 - 709	15 - 723	AI005650, AW193649, T86155, R91705, R94928, T86262, R92142, T78635, BG059124, BG059311, T79120, BG105372, BE903730, F32795, AI086235, AI304866, AI094698, AI268640, AA894578, AI081163, BE856894, AI380568, R12395, BG031198, AI708047, AI358636, AI142089, AI216820, AI684336, AA804193, AA552494, AA687862, AA507473, AA879115, AA279014, AA513429, AI571415, AA918417, AI971055, AI051704, AI937021, AA099438, AI494389, AI493513, AA948053, AA581118, AI184757, AA100071, BE731794, AI879919, AI085722, AI536966, AI591039, BF124917, AI830888, AI334931, AW008928, BE274775, BE902881, BF125296, AA595467, BE281210, R71239, BE392986, BE268783, R96465, F37009, BF818912, AA401736, AA857524, AA654076, AI620153, F21367, AA292902, AF004164, AA316678, BF845471, BE694933, BF433106, AW166722, AI866691, AI859464, BE047798, AI521799, AI589947, AA713511, AW082623, AA713851, BG110241, AI918554, AW151979, AW006947, AI889379, AI049669, AV750565, BF791871, AL042191, AI345415, AA580663, AI690813, AW194014, BG029058, BF814360, AI690948, AI554343, AI866465, AI623941, AI560227, AI801325, BE965064, AW083804, AI623648, AW263569, BE393551, AI499986, AW055252, AW263804, AI627714, AI688854, AA761557, BE883591, W48671, AI287476, AI886355, AI500523, AW088605, AI433611, AW025279, BF925370, AI241763, AI491710, AI468873, AI859644, AI658566, BE879772, AI860027, AI023513, AI865942, AI648699, AI285439, AI334893, AI699020,

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HPIAQ68	442	833082	1 - 2452	15 - 2466	W89022, W89021, AA400091, AA480871, AA480928, AA400180, H72944, H72544, AV731860, N62805, AI827122, AJ742541, AI820089, AI650350, AI499934, T17487, AI922817, AI590848, AI679031, BE141338, AV720191, M85961, BE093537, AW893527, AW893524, AA909164, BE093538, BF222081, AL049831.2, AL138776.10, AC004825.2, AC005539.1, AC008151.1, AC006152.3, AC008085.1, AL139141.22, AL133512.10, AC073310.7, AC002069.1, AP003547.2, AL353133.7, AC011716.7, AC004070.1, AL391559.13, AC011286.7, AL133238.3, AC026116.26, AC002068.1, AC007463.3, AC007632.4, AC080011.21, AL035409.15, AL096888.30, AL136130.7, AL391557.11, AL512272.15, AL109913.20, AC002402.1, AC009302.2, AL356750.16, AC006324.3, AL133342.14, AL590635.7, AL160008.3, AC007253.2, AL035070.3, AC025577.15, AL035451.5, AC016902.4, AL445240.8, AP000802.4, AC012152.12, AC009757.8, AC016648.5, AC026441.4, AC000122.1, AC024028.10, AL139112.9, AC019197.7, AC010738.4, AC015933.8, AC007631.3, AC010351.6, AL034409.4, AC012081.16, AC024603.5, AL079352.3, AL442166.1, AL137861.5, AL163284.2, AC008170.2, AL008729.1, AC040171.3, AC006034.2, AL355537.11, AC009496.3, AL445225.9, AL365400.19, AL022154.1, AF001552.1, AC007639.5, AC005083.1, AC006925.6.
HPBO15	443	1310868	1 - 1725	15 - 1739	AI056404, AI802391, AW270724, AI750249, N41425, N47678, AI188511, AI376981, AA029314, AW452123, BE466507, N39755, AI937190, AA063620, AA693737, AI139466, AA701241, AI250789, AI672263, AI198257, BF055537, AI199035, AA677064, W69895, AA040154, BF196981, W73711, AA029867, W69841, BF222273, AW900121, W022270, W69574, AI373227, AI200161, AA701858, AV690112, AW044223, W69662, AI052153, AA872860, H29417, H29324,

						N26312, A1283749, AA036704, A1383659, AA332627, N47677, A1424682, BE089934, AA329748, AW952484.
HPJBK12	444	1011467	1 - 2634	15 - 2648		AP001206.3, AP001329.3, AC013541, AC013541, AC022033, AC022033.
HPJCL22	445	1146674	1 - 3093	15 - 3107		AU140137, AW273142, BF511622, AW500031, AW997852, AW997845, AW997846, BE263631, AW997843, A1457507, AW449421, AW451219, BE047152, BF946370, BF439925, BF946380, A1200349, BF897509, BF512501, Z19075, BE827516, BF094042, BF094020, BE244735, AA325330, AW962065, R31240, A1023715, AA736958, BF802328, BF988285, BG015997, AA215423, BF736763, AW997844, AA285156, A1254765, BF902055, BF724699, AV740801, AA847952, AA634889, A1284640, AA074818, AL134972, BF724366, AW274349, AV763138, AA468131, BF946053, BF945647, AV729809, AW303196, A1801148, AL038072, AA873777, AL133662.1, AB020720.1, AB051126.1, AK023742.1, AC020916.7, AL512802.2, AC005098.2, AL109758.2, AK024937.1, AL096701.14, Y11535.1, AL080243.21, AL137073.13, AL137059.20, AL590709.5, AP002378.3, AL158210.12, AC006064.9, AC002563.1, AP001064.1, AC017016.5, AC004836.2, AF238380.1, AL021918.1, AC018641.3, AL136162.17, AL035460.15, AC084356.22, AC005943.1, AL157877.11, AP000760.4, AC021752.5, AC011446.6, AL121895.26, AL451075.15, AC011308.8, U67829.1, AL034429.1, AL049776.3, AC003043.1, AF059321.1, AP001748.1, AC074115.4, AL133622.1, AC016138.8, AF052144.1, AL136295.3, AC005007.1, AC018618.5, AC026672.44, AC016597.4, AL136305.14, AL352979.4, AL133545.10, AL360169.17, AL031587.3, AC026184.3, AC074121.16, AC044797.5, AL117382.28, AL358293.4, AC007546.5, Z95152.1, AK022069.1, AC010618.7, AC011470.5, AL157912.5, AL022721.1, AC004084.1, AL157789.6, AL137495.1, AC005015.2, U07562.1, AC073492.18, AC005144.1, AC008635.6, AL035704.9, AC067722.21, AL121829.30, AE006464.1, AL590763.1, AL049610.9, AL137244.28, AL162272.10, AF254983.2, AP002371.3, AC010527.5, U73023.1, AC020904.6, U91322.1, AC012306.11, AL352984.4, AC020955.6, AC018523.9, AC004928.2, AF015156.1, U95739.1, AC027319.5, AL138717.6, AL163201.2, AC008555.5, AC011497.6, AC019206.4, AC007005.3, AC018504.4, AC020552.4, AC068313.4, AC004867.5, AL355392.7, AL021397.1, AC010312.4, Z97630.11, AC022400, AC022400, AC022400, AC037447, AC037447, AC037447.
HPJCW04	446	589969	1 - 1452	15 - 1466		T81065, H59556, T70276, H59557, AC002519.1, AL136123.19, AC090051.8, AL021579.1, AC010202.6, AC025589.20, AC02267.8, AL359272.9, AC022148.5, AC009756.9, AC078962.30, AL356121.13, AC007880.2, AL137793.16, AC002059.3, AC008450.5, AC010654.8, AP003114.1, AC007226.3, AL033519.42.
HPJEX20	447	1352420	1 - 552	15 - 566		AW938132, AL139283, AL080251, AL080251.
HPMAI22	448	635491	1 - 1260	15 - 1274		A1540210, AW173208, AW006589, AV707182, AW104434, BE503183, A1148598, A1656207, A1350808, BE503507, AW297121, AW237250, AA918535, BF057772, AA918200, A1357673, AW235193, AW083055, BE503001, A1350807, A1200477, A1991567, AA953496, A1825590,

						AA738163, AW962712, N59298, AA369466, H71562, AA369367, AA369366, H71045, T48746, H71557, AL354716. 9.
HPMFP40	449	638165	1 - 1203	15 - 1217		U48436.1, AC005731. 2.
HPMGJ45	450	798102	1 - 1642	15 - 1656		AI800816, T70609, AA001037, T70876, AW295609, AI174704, AA488148, BE818897.
HPQAC69	451	396804	1 - 976	15 - 990		BE825496, Z21226, AL159154.16, AF075587. 1.
HPRBC80	452	829136	1 - 2529	15 - 2543		BF508706, BG251902, BG118348, AL522364, AI690187, AW959485, AV705315, BF672789, AL520227, BG176557, AI528876, AV713609, BE439925, BF130665, AW963928, BF994344, AL536566, AA446397, AA180531, BG026529, AA180520, BF672895, BF029282, BF670440, BF799935, BF510400, AA179618, AL513906, BE246173, AA625572, BE244085, BF671786, AI681635, BE004437, AA431963, AV701964, BE566300, AV653358, BE004444, BF790083, Z30124, AA164383, C17250, AA379401, N24451, AA363823, BE004648, AA180509, AV713647, T35331, AW961450, BF800059, AV686722, BF575322, AW020971, BF229438, AW361378, AA465249, AA313690, BF979498, BE694196, AW999825, T35345, AA625571, BE925937, T30431, AA135096, BE172414, BF980120, N54675, AW897938, BF210564, AW665936, AA769851, Z20951, AW242738, Z19798, C16481, AW197150, AI567621, BE222028, BE622950, AW883664, AA885770, AI039327, AA628005, N50019, AI650889, AJ271835.1, AF136972.1, AC013717.8, AJ271832.1, AF294792.1, AJ005801. 1.
HPRSB76	453	526310	1 - 727	15 - 741		AA447438, T09355, AB051358.1, AB011138.1, AY029493.1, Y09954.1, AY029491.1, AY029492. 1.
HPVAB94	454	526749	1 - 805	15 - 819		BF370024, AW449056, AF131217.3, AL163247.2, AF165147. 1.
HPWAY46	455	1001560	1 - 1400	15 - 1414		AW857326, AW861371, AV661974, AW857769, AW861551, AV661986, AW937024, BF130874, BE067001, AW861563, AA460256, AA908484, AI804404, AA235344, AI827237, AW833214, AI682922, AI306704, BF382808, AW151460, AW294348, AA336017, AI553689, BE066930, BF914075, AI016721, BF507352, BF114874, AC067828, AC067828, AC019036, AC019036.
HPWAZ95	456	413270	1 - 309	15 - 323		AA651639, BF668217, AL046409, BF677892, AA581903, AW518220, AW303196, AW301350, AW274349, AL119691, AW964231, AW327624, AI696955, BE160727, BG059568, AA521323, BF130605, H05940, BE910362, BF769368, AW979060, AI281881, AW858127, AA521399, AA148672, AW965008, AL042853, AV734666, AV762033, AA167055, AV761519, AW513362, BF965007, AW975012, BF724699, AW270382, AC018738.4, AC006262.1, Z69714.1, AL109952.15, AL109897.30, AC008760.6, AC005939.1, AC004687.1, AL158040.13, AC011737.10, AC008745.6, AL050321.11, AL034420.16, AC004854.2, AC007216.2, AJ400877.1, AC004150.8, AL117692.5, AC004033.3, AC068799.14, AF015151.1, AF015156.1, AC007731.14, AC080012.20, AC010422.7, AL358354.16, AC053467.1, AL118502.38, AL121969.12, AL035079.14, AC005921.3, AC005209.1, AC005098.2, Z95115.1, AL121989.12, AL354720.14, AL035529.25, AC004417.1, AC010328.4, AE006639.1, AC004166.12, AC008750.7, AL049761.11, AL096701.14, Z99716.4.
HPWDI42	457	722246	1 - 1326	15 - 1340		



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HPZAB47	458	585702	1 - 1662	15 - 1676	AW993896, AA493291, AA526359, AW972615, A1720194, AA358397, AW204400, AA508549.
HRAAB15	459	658717	1 - 1733	15 - 1747	BG111918, A1823987, A1807761, AW165961, A1418806, A1738753, C05983, BG152897, A1439250, BF327504, AA923586, A1424510, BE003132, BF894183.
HRABA80	460	882176	1 - 1237	15 - 1251	AU147250, F24079, A1791459, A1732503, AA523577, A1791342, AU121439, BF309840, BF308519, A1659402, AA719317, AA602233, A1752815, AW967109, AV694013, AA470486, A1218622, AA644545, AK022184.1, AC005777.1, AL031431.8, AC007406.1, AC032011.14, AC004143.1, AC006131.1, AC074121.16, AC005760.1, AC005529.7, AL354766.17, AC025166.7, AC012476.8, AC005544.1, AL035079.14, AL356299.16, AL031297.4, AC005778.1, AC011666.28.
HRACD15	461	871221	1 - 1525	15 - 1539	AL519765, AL519766, BE910445, BF684654, BE270497, BE513843, BF975936, BE396890, BF973472, BE515166, BF686665, BE744708, BG257119, BE880162, BE797305, AW248552, BE514176, BE793786, BE791776, BE296702, BE271500, BE268991, AW512838, BE791090.

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HRACD80	462	1309774	1 - 1927	15 - 1941	BF001770, AI431600, AI332903, AW778829, BF197765, AI814110, BF875981, BF509841, AI983390, AI741104, AI263763, AA719400.
HRDDV47	463	637650	1 - 1496	15 - 1510	BG035895, AI271436, AW510873, AW341493, AA833696, BF205827, AA280770, AW137710.
HRDFD27	464	567004	1 - 791	15 - 805	W85784, AI254961, AA767643, BG164474, AA428410, BG007947, AI625142, AI11171, AC005274.1, AC004491.1, Z68192.1, AL365225.12, AL033529.25, AC009086.5, AC008569.6, AC002420.1, AC022392.4, AC012170.6, AC008474.7, AL157912.5.

HRTAE38 HSATR82	465	519326	1 - 586	15 - 600	AC004966.2, AC002551.1, AL035695.17, AC005184.1, AC002115.1, AC027319.5, AC020610.6, AL121777.39, AC024568.4, AC009412.6, AC009055.2, AL133453.3, AP003352.2, AL163248.2, AL118520.26, AF260011.2, AC005940.3, U95742.1, AL022396.1, AC005362.1, AC004841.2, AC007676.19, AC024578.3.
	466	531973	1 - 763	15 - 777	AA372458, AC004189.1, AP00517.1, AB023054.1, AC009313.4.
HSAUK57 HSAUL82	467	772554	1 - 1023	15 - 1037	BG056575, N22501, AW884147, BF903801, H59173, AW963463, BF997339, AW958318, AA374525, AW502694, BF816190, AA364420, AA78207, AA810158, AC007130.2, AL122035.6, AL353692.14, AF124523.1, AL391122.9, AL035404.20, Z93241.11, AC007917.15, AL353680.8, AC005881.3, AC005740.1, AP002851.2, AL133477.16, AC004805.1, AC008891.7, AL390882.12, AL031602.14, AC005015.2, AL133479.11, AC005920.1, AL136228.8, AL139317.5, AL137792.11, Z84487.2, AF205588.1, AC007782.20, AD000092.1, AC025594.5, AL109804.41, AJ009612.5, AP000557.2, AC072061.8, AC083884.6, AC005529.7, AL133243.1, AL096791.12, AL137802.7, AL133410.31, AF243527.1, AC005399.19, AB026898.1, AC004883.2, AL392166.19, AL050318.13, AP003357.2, AC009331.5, AC011455.6, AC004965.2, AL139021.6, AC024603.5, AC005914.1, AL121809.6, AC069262.24, AC004867.5, AC005519.3, AC069025.4, AC008088.8.
	468	490879	1 - 713	15 - 727	AC008860.6, AC008860, AC008860, AC025444, AC025444.
HSAVD46	469	456536	1 - 759	15 - 773	AI801272, AW510484, AW938669, AW963599, AW964519, AV703063, AW962942, AW967052, AW961606, AW967329, AW961841, AV727589, AW962648, AV725024, AV726532, AW963592, AW963349, AV728841, AW950748, AV728138, R47506, AW962444, AV707331, AV707907, AV687010, AW963895, AV704876, AW963486, AV702738, AV702975, AW954242, AV742541, AV702107, AW963608, AW964860, AV688658, AV708167, AV704541, AV652563, AW964213, AW957644, AV721745, AW962321, AV691793, AW962155, AV707237, AV703844, AW963652, AV702172, AW962136, AW963498, AV707135, AW961299, AC012076.4, AL049780.4, AC008736.6, AC008395.6, AP002841.2, AL160269.14, AC004166.12, U95742.1, AC007216.2, AL121972.17.
	470	545459	1 - 586	15 - 600	AL519778, AL519564, BE549977, AW293350, BE673994, AI479992, BE467490, AI802131, AA903062, BE218785, BF111390, AA527216, AI269065, AW022008, BE817446, AA328288, AA904434, AW394125, AL037626, AC078983.17.
HSAVK10	471	561435	1 - 1228	15 - 1242	BF793712, AW080832, AI693734, BE869501, AI564525, BF037343, AW475057, AA523950, AV719716, AW024144, BF827012, AI185475, AI197788, AV660309, AI708671.
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HSAWZ41	472	580872	1 - 1374	15 - 1388	AL547110, AL344906, AL138548, AV683406, AA425283, AW162314, AW409621, AL174703, AF126947, AA493546, BE139230, AV758849, BE677164, BG003974, AI065031, AA280886, AV763460, AA584360, AI251024, AW504667, AA533660, AW021674, AA493245, AW162332, AA313025, AA524604, AA557945, AW410844, AI028148, BF882222, AW069110, BG180320, AA577706, AW963552, AI890283, AU120423, AW474825, AW514844, AW023975, AI003068, AI281622, AI275989, AA601376, AI753131, AW151848, AI754926, AW662484, AA533066, AV762541, AI114543, AW265468, BE244308, AI572680, AW085811, BE747923, AV760048,

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HSAXA83	473	545051	1 - 635	15 - 649	BE275396, BE275061, AA313781, BF977059, AI640202, AV709881, BE677876, AI291229, BF693434, AV710052, AI366963, AW137805, AI968874, AV744018, AV708132, AV688915, AA083495, AA336782, BG258938, BE142105, BF896038, BG031184, BE168021, BE890609, AV752295, W25439, R18412, BE903633, BC008739.1, AF164793.1.
HSAYM40	474	462797	1 - 419	15 - 433	AA456872, H29988, AW966389, AW964541, AV702035, AV705589, AW964468, AV706147, AW966330, AW949645, AV704548, AI535686, AW975618, AV724320, AV718692, AW964532, AA809122, AV718489, AV727418, CI4331, AW973445, CI4344, CI4407, AW973541, AV699927, D51799, AW966343, AV720088, AV718800, AV692290, AV720104, AV707449, AW966397, AW960483, AW973330, AV720791, AV650003, AW966062, AW966369, AV726330, AV719822, AV699550, AV722801, AW975613, AW973490, AW975623, H67854, AW975605, AW966342, AV719557, AW960081, AV718487, AW959799, AV718938, AV718633, AW966378, AV718931, AV720731, AV720533, D81111, AW965176, AV719391, Z21582, AW966399, D58101, AW960534, AW978634, N66429, D80164, D59859, D59610, D80439, D58246, D81030, D80251, D57483, D80157, AW973307, D51053, AW966059, AA305409, AW973488, AW960454, D80166, AW973474, D80212, D80268, D80366, AW950117, D59889, AW949629, AI525920, D80188, D51423, D59619, D80133, AW978661, D80210, AV720151, AW960553, D80240, D80253, AV701839, D80219, AV719945, AW973447, AV719324, AW952839, D80064, AW960473, AW950578, AV718707, AW966075, AW966386, AW966065, AV720211, AV720878, AW966368, AV720616, AV718427, AV720729, AW966032, AW966331, CI4014, AW966398, AW959582, AV699447, AV700357, AV721386, AW958993, AW949498, AV723927, AV699866, D51060.

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HSDAJ46	475	692358	1 - 1523	15 - 1537		AI800075, AI686505, AV726613, AW023374, AA418208, H97489, AA620395, AA418073, AW027850, AA401879, N67776, AI168759, N36146, AA700811, N28007, AV952793, AA012999, AW904436, H99095, AI015805, H82563, H60753, R87427, AA688368, BE702596, W03403, H59689, H83666, R85022, AI582759, AA205528, H83667, N35665, AA322820, AW072108, H60754, R07653, AA339201, H59688, R07706, N26551, N69337, H84836, N88280, BE744699, AA640177, AA221012, AA094140, AB025904.1.
HSDEK49	476	1352253	1 - 1768	15 - 1782		AL513706, AL513705, AV700980, BF343961, AV710516, AV716397, AV715849, BF351156, AV717025, AW071975, AI922669, AI129815, BF106386, AA702864, W32947, AV690218, AV685715, AV693576, AV686846, AV695322, AV697709, BF924861, AI168499, AI343825, AA627735, AI554367, AI335089, AV697729, AI290781, AA875852, AA442570, AV686969, AV698914, AA486920, AI357884, AI088635, W79882, R39812, AV683817, BF932594, W17367, N78991, AA972857, R62969, R59135, AW961380, R56601, BE857524, R66262, W74268, AA436814, AA813538, H05057, AI133776, Z43556, R14044, R81029, T48889, AA228697, R56602, AA142932, R63023, Z39624, F02373, AA993978, R66723, R67603, R59136, R80928, AA133775, AW874480, T48888, AA228698, AA368546, BF525711, AA115592, AA328299, AA486747, BG001652, AI132502.1, AL034397.1.
HSDER95	477	664502	1 - 560	15 - 574		BE881136, AW005333, AA631227, AA143192, AV707034, AA181022, AI301959, H98648, BF507561, AU143221, BF514388, AA594850, AI478582, AV681894, AA287457, AI393857, N75788, BE044258, AA211849, F06608, N22567, AW450628, AA563681, AW195766, AI915322, BF701252, AA186657, AA992992, AA143136, AI302352, BF033111, AA631048, AV706818, AI341927, AV703142, BF446906, BE693340, AW961036, BE676990, AI870902, AV744251, AV749732, N75929, AW887695, AA973384, AA160641, AA338837, AK024037.1, AL359596.1, AL354891.11.
HSDEZ20	478	1352287	1 - 781	15 - 795		AW864388, BF680896, BE220848, AI982565, BE967606, BE042914, AI215617, AA553540, AW864512, AL118801, Z45033, BF949835, Z40201, T87220, F09990, H11649, R38421, F07708, RS5771, R45396, F04558, R41971, AI863613, T16890, AW051331, F03377, Z40771, AA188521, AI699582, F04949, H97413, AI784055, AW510885, AW136105, AW467042, AL046385, AI690813, AW080157, BF724894, AI364167, AI288328, AW265004, BE907663, AI559752, AL514511, AW972273, BF345598, AL514409, BF968666, BF868489, BF997967, AI689096, AW827289, AI925164, AI922597, BE876976, AI683270, AI342023, AI049669, AI513977, AL514359, AI950729, AW198090, AI598017, BE538997, BG105381, AI359787, AI370623, AW972279, AW087837, AI824357, AI860787, AL515413, N25033, AI581139, AI370623, AW972279, BG167830, BG033608, AI952306, AL513729, AV750565, AI421662, AI568061, AI580027, BE964206, AL513913, AI933574, AL514493, AI524179, AI610671, AI925281, AI917428.
HSDAJ15	479	795252	1 - 1429	15 - 1443		

					AI499963, BE780955, AI628214, AL514721, AI341690, AI224373, AI538008, AL514015, AL515171, AI887163, AI932794, BE729304, AI872154, AI267454, AI677646, AL514357, BF811802, AI635528, AV682250, AI638644, AW084896, AI890907, AL514791, AW105429, AW081648, AI538850, BG111199, AI583670, BE965732, AI345415, AW089844, BG029709, BF970652, AW020397, AW268221, AI446704, AW263796, AL514455, AW301974, AI049923, AI909641, AL513693, AI357902, AL513863, AV682403, AI651609, AI612107, AI499570, AI471325, AI522052, AI440238, AW020328, AL513865, BG114304, AL513713, AV682366, BF037097, AI289483, BF751299, AF255922, AL109779, AL161964, AI, AK025113, AL136825, AK024992, AL133084, AF369701, AB062978, AK000476, AK026038, AF232009, AL050366, AF339775, BC007460, BC009398, AB060884, AB063074, AK000083, AL162002, BC005805, BC004899, AFI55656, AF326206, AF265236, BC004925, BC001967, AL359583, AC026307, BC009294, AL122110, AF02672, AK000653, AP001624, BC004292, AK027204, AL117460, AK025258, AK000718, AL389983, BC003591, AK025099, AB056421, BC001059, AK025092, AB047627, AL136805, AL133559, X68560, AF001746, AL133049, BC004349, BC005094, AL050149, U62966, AC002471, AC005374, BC008282, AK024747, AL133072, BC008591, AK026630, AL137533, AB060229, AC079801, BC009285, AFI83393, AK025435, AL133608, BC005007, AL133088, BC007567, BC007420, X99971, S71381, AK027116, AF277181, BC004202, AL117435, Z35309, AK026633, AL117587, AL080154, BC005816, BC006458, BC002733, BC008649, BC001785, BC001964, AK026570, AL080150, AK025465, L10376, AL450164, AL137271, AK026885, BC004513, AL122100, AK027260, BC008387, AI001838, BC007905, AL117626, AFI43723, AFI41289, AFI03804, BC000100, AK024855, BC001305, BC002933, AL137548, AF090934, BC008364, AF217994, BC000090, S70057, AK024978, BC007796, M92439, BC003410, AK000418, BC006091, AL137560, BC008504, BC004951, 1.
HSDSB09	480	1301498	1 - 795	15 - 809	BF432333, AI861851, AI240993, AI795956, AI074484, AI640759, AW006868, AW241621, BF592070, AW271387, AW614840, AW450466, AW243423, AI244694, AI640517, BF431431, BF431530, AI439169, AI613108, AI915938, AI984796, AI245393, AW300335, AA931466, AW235983, AC005722, 1.
HSDSE75	481	545057	1 - 1137	15 - 1151	AW378251, BF349814, AA687791, BF739001, AW378183, AA661723, H61383, T88677, H62404, AA443169, AW339864, AA458622, AA252063, AI129690, AW960791, AB006755, 1.
HSPAM31	482	552789	1 - 854	15 - 868	AB006756, 1.



AW510513, AW968188, AW089861, AL532829, AA587812, AA584756, AU120143, AL628859, BG222813, AA532875, AA661883, AI370170, AW606874, AI536858, AI130709, AA846923, AA077637, AV760497, AV691556, AV693536, AW272640, AC008755.6, AC002350.1, AL033529.25, AL132653.22, AC006160.9, AC005529.7, AC020916.7, AL162505.20, AC007318.4, AP000692.1, AC004000.1, AL162426.20, AC004967.3, AC011895.4, AL590762.1, AC005920.1, AC005527.3, AL132768.15, AL118520.26, AC083866.2, AC005081.3, AL136123.19, AC005520.2, AC018738.4, AC011005.7, AC005519.3, AC005098.2, L78810.1, AC074121.16, AC005914.1, AC005399.19, AL162430.15, AC027319.5, Z97054.1, AC002565.1, AL121886.22, AF288742.1, AC005874.3, AF134471.1, AL354808.24, AL136137.15, AF001549.1, AC004686.1, U47924.1, U63721.1, AC006038.2, AC006285.11, AL138724.12, AC018663.3, AL109804.41, AC005803.1, AC011455.6, AC022211.5, AC009412.6, AL136418.4, AL139054.1, AP001725.1, AC016776.6, AC006057.5, AC008397.7, AL590763.1, AP003439.2, AC008521.5, AC019205.4, AC005088.2, AC005225.2, AL122035.6, AC004840.3, AL162231.20, Z93017.6, AC004019.20, AL022476.2, AC072061.8, AC008280.4, AC013449.8, AL031283.26, AL034405.16, AC011475.6, AL139100.9, AC021016.4, AL049843.18, AF134726.1, AC012442.7, AP002898.1, AL049539.21, AC005288.1, AC005236.4, AC006329.5, AL136979.16, AL080243.21, AC020552.4, AC010422.7, AC002425.1, AL354932.26, AL022238.1, AL138752.5, AC026464.6, AL355499.15, AL050349.27, AC004216.1, AC004867.5, Z93241.11, AP001712.1, AC008068.4, AL121652.2, AC002563.1, AC022383.3, AC008267.6, AC005841.3, AL160175.5, AC008622.5, AC005180.2, AC008745.6, AL096701.14, AC013467.8, AJ003147.1, AC003982.1, AC009812.17, AC011461.4, AC020350.4, AL139330.17, AL391827.18, AE006467.1, Z98884.11, AP000466.1, AC023105.7, AC008738.6, AL049872.3, AL008718.23, AF038458.1, AC005800.1, AC083868.2, AC005839.1, AC002477.1, AC008372.6, AC008427.7, AC005412.6, AC083884.6, AL109963.4, AL022336.1, AP001728.1, AC008403.6, AC008569.6, AC000025.2, AF030453.1, AL139082.18, AL132639.4, AL161936.15, Z84487.2, AC011449.6, AC006480.3, AC004971.3, AF196972.1, AC005037.2, AC004983.2, AC006111.3, AF168787.1, AC004846.2, AL049776.3, AL137012.6, AC005368.1, AC004905.1, AC018809.4, AC008655.6, AC009155.3, AC011442.5, AC078962.30, AC011443.6, AL121601.13, AC026172.3, AC004832.3, AC006088.1, AL031591.19, AL009181.1, AC073073.2, AC004966.2, AF001548.1, AL451125.7, AP001711.1, AC010378.6, AC004491.1, AC009032.7, AC009086.5, AC022384.4, AC007637.9, AC005086.2, AL355480.22, AP000011.2, AL035450.1, AC022392.4, AC011446.6, AC011465.4, AC005722.1, AJ246003.1, AL353692.14, AC083863.2, AC004084.1, AL133215.16, AL031774.1, AL034420.16, AL138756.23, AL022316.2, AC004873.3, AF258545.2, AC009144.5,				
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HSHAX21	483	612823	1 - 1972	15 - 1986	BE379784, AL522216, BF439334, AI652855, AI766309, BF512139, AI635715, AW299533, AW299897, AI129966, AW411210, AI624534, AI925109, AI803484, AI804159, BF184613, AA279212, AI609083, AI969459, AI860837, AA879465, AI183591, AW104990, AW316983, AW474646, AW630619, AI955714, AW409582, AA678827, BE139077, AA766602, AI431314, BF087963, AA081236, AW194027, BF701425, AI521521, AA588351, AI923638, AU155980, N39554, AV686756, AW769352, R78080, AW613876, AA259257, R22218, AA443811, AA969814, AA729654, R80114, T60532, AI969030, AW572611, AA259256, R80005, AW805183, BF592136, T51990, BE972627, Z38832, R23587, R24524, T52102, AA371263, AI564179, AI783565, BF700820, BE619819, AA447188, AK001845.1, AL136705.1.
HSIAS17	484	1352191	1 - 1767	15 - 1781	AL519037, AL522565, AL519036, AL529136, AL529135, AL530266, BE745103, BE528553, BF971144, BE745909, AW328641, BF796812, AL523650, AL525532, BE889377, BE514827, BF982724, BF036473, AW241827, BE378558, BE207101, BE675053, AI888192, AI990765, AW583031, AA469984, AA469998, AI660851, AW615511, AA412213, AW269957, BF589410, AA829396, BE673372, AW873087, BF589512, AW590539, AA834131, AW004730, AI204640, AA233023, AI339908, AW183546, AI434667, BE300850, AA884392, AW769309, AW138531, AA377194, AA55187, AL523649, AW138564, AA232705, AI698753, AA340084, AW584027, AI950847, R09010, BE151689, AI864316, AA523007, R05695, BE122646, BE122728, AL045891, AL041862, AL042898, AL079977, AL047092, AL047163, AL046356, AL043089, AL043321, AL043196, AW858522, BF726868, AL042745, AL042488, BE047737, AW772685, BF726504, AW827276, BF726001, AL515043, BF970449, BE048013, AL513961, BF793324, AW663332, BE048179, AL047675, BF727212, BF726322, BF726234, BG249582, AL045327, BF726297, BE904178, BF727092, BF726894, AL038878, AW150511, BE963035, AL044276, BE018334, BF338002, AL040097, AL045500, AL515035, BF814447, AL040207, BF038131, AL042744, BG164371, AL047037, AI289310, AL042538, AW827175, AL045620, AL042515, BE047852, BF338723, BE897632, BE876033, BE885490, AL039276, AI609556, AW858243, BF680133, BG256592, BE880182, BE048319, BG036846, BF970768, AL514885, BE967104, BF822127, BE874133, AW673679, AL045163, BG252040, AI923509, AL514843, BG105240, BE875243, BG168185, AL514939, AL042628, AI494201, BE963560, BE048081, AL047611, AV729953,

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HSIDX71	485	1033671	1 - 2104	15 - 2118	<p>AK026526.1, AK027204.1, AK027213.1, AK025632.1, Y14314.1, AK026927.1, AF260566.1, BC005678.1, U80742.1, AL137480.1, U91329.1, AJ012755.1, AL133112.1, AF207829.1, AK027116.1, AL136799.1, AB055361.1, AF078844.1, BC001418.2, AK024524.1, AL136928.1, AK027081.1, AF079796.1, AL162008.1, AB048964.1, AL117583.1, AB063046.1, AB060908.1, AL137459.1, AK025431.1, AL117585.1, AK027200.1, AB05368.1, BC007680.1, AB052200.1, AK025524.1, AK025484.1, AL136845.1, AL359618.1, AL122093.1, AL133113.1, U42766.1, AL122123.1, AL080124.1, AL583915.1, AL512750.1, BC004244.1, AK000618.1, AB063070.1, AL110196.1, AK026353.1, AK000432.1, AK000137.1, AK025339.1, AC026464.6, BC004951.1, AL050172.1, AB060916.1, AL162006.1, AK027160.1, AB047904.1, AB049758.1, AK026631.1, AL137658.1, AY026527.1, BC006807.1.</p> <p>AI921837, AV760391, AV760466, AV760389, AV733824, BE252421, BF725761, AV756220, AV759518, AV760019, BF868994, AV760560, AV762645, BG029528, AA760655, AW963474, AA594157, AL138431, AV698087, AI583252, AW851405, AW075768, AL042377, BE301584, BG164617, AL041924, BF342223, AA129746, AI732483, AA808153, AL037683, AI345695, BE882869, BE875478, AI917891, AV760508, AW855643, AL042853, AW975626, AW505253, BF828714, BF826830, AI169245, BE973547, AC007193.1, AL031985.10, AC006530.4, BC008387.1, AC008806.4, AC020558.4, AC009274.9, AC025594.5, AC004975.2, AL355392.7, AC009244.24, AC020906.6, AC008812.7, AC074121.16, AC002302.1, AL008635.1, AL353807.18, AF312915.1, AP001710.1, AC009131.6, AL354808.24, AP001694.1, AL031729.16, AP000208.1, AP000130.1, AL117694.5, U91323.1, AC020754.4, AC004686.1, AL138836.15, AL157838.24, AC004031.1, AC020916.7, AC006115.1, L30117.1, AC022206.3, AC007376.9, AL161747.5, AC002425.1, AL031003.1, AC009087.4, AL079342.17, AC010458.5, AF099810.1, AC008569.6, AC007225.2, L78810.1, AC002492.1, AL138724.12, AC005052.2, Z82214.23, AC005081.3, AC034251.5, AL049540.11, AC010473.5, AC003029.2, AC005224.1, AC004067.1, AC019046.4, AC004906.3, AL096701.14, AC024028.10, AL590763.1, AC009412.6, AP000514.1, AC010358.5, AC005754.1, AP001716.1, AL391259.15, AC002041.1, AP001623.1, AC015982.9, AC009408.3, AB014078.1, AF200465.1, AC007055.3, AC026464.6, Z98036.1, AF196779.1, AC005971.5, AL035071.17, AL049780.4, AL121658.2, AC010319.7, AP000873.4, AC007298.17, AC005799.1, AC005566.1, AL355343.18, AP003357.2, Z68284.1, AL022165.1, AC020644.6, Z85987.13, AC021396.6, AF279660.2, AL035703.20, Z85996.1, AC011742.3, AF243527.1, AL049776.3, AC002551.1, AL121895.26, AL049872.3, AC010742.4, AC012591.8, AC011464.5, AC007390.3, AL136126.34, AC018764.6, AC027319.5, Z93017.6, AL135839.15, AF024533.1, AL049637.43, AP001705.1, AC034242.5, AC004840.3, AC007617.10, AE006467.1, Z84487.2, AP000247.1, AL121585.22, AL391280.15, AC003043.1, AL138688.27, AL138743.5, AC008755.6,</p>
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HSKDA27	486	1352409	1 - 4398	15 - 4412	<p>           AJ003147.1, AC005902.7, AC011455.6, AC005519.3, AP001666.1, AL139286.13,            AL355916.2, AC013726.7, AC006357.5, AL049699.8, AL021918.1, AL133477.16,            AC009953.4, AC004832.3, AC002467.1, AF334404.1, Z86090.10, AP000424.3,            AC005231.2, AL109807.16, AC006451.5, AC008745.6, AL354776.15, AC025262.27,            AC007664.12, AP002898.1, AL020997.1, AL021397.1, AL137139.9, AC005037.2,            AC004953.1, AC008687.4, AC034240.4, AC005015.2, AL023693.25, AK025772.1,            AL160191.2, AL136295.3, AC008754.8, AL049829.4, AC010326.6, AL022320.23,            AC005527.3, AL138878.10, AC015968.4, AL163218.2, AC022083.6, AL133387.8,            AF196972.1, AC004967.3, AL449305.4, AC005736.1, AC005730.1, AC010956.12,            AL132795.12, AC000360.35, AC011994.10, AC018641.3, AC020750.3, AP000783.4,            AL133453.3, AL121926.24, AL109952.15, AL355353.23, AL033529.25, AC012384.16,            U91321.1, AL139339.22, AC012507.9, AC016995.4, AC007041.3, AL353596.13,            AC011452.6, AC005255.1, AC007868.2, AC009247.12, AL356983.33, AL135927.14,            AC005409.1, AC007536.9,            BF338364, BG253437, BG122685, BF037455, AW303375, AW173315, BF037378, BG120262,            BG117983, BF915045, BF057308, BG252401, BG034853, BF793365, AW379378, BF826037,            AA570507, BF915582, BG122734, W07328, AA600736, AL971935, BE697573, BE313814,            AI090486, AI751258, BE839359, BF447303, AW631492, AA625303, BF513067, AI609700,            AI768270, AI751257, BE939504, AA417652, AI751036, BE378218, AI652363, AI971415,            AA599207, AI371013, AA024968, AI147536, W55850, AA063585, AW794702, AA446024,            BE889110, AI828437, AI862133, AA421744, AI272646, AI148235, AA419609, AW005418,            AA634323, BF883408, BF378271, AA416767, AA258414, AW305114, AI083516, AI752526,            AW024492, AI698032, AW957682, AI092202, AI191710, C05155, AA419525, AI218226,            AI754332, AW794499, AA410929, AI936116, AI079893, BE272411, AA593295, AA455497,            AI039656, BG035195, AA747741, AA774270, AA364833, AI350380, BF940413, T59268,            BF197746, AI084698, AW800540, AA834031, AI673345, AW795817, AA978105, AA622501,            AA032249, AA912802, AI432010, N66832, AI751035, AI754989, AI082183, BE178218, AI751086,            N75819, N67061, AA971661, AA873147, AA478719, AA036654, T59227, AI538117, AA662437,            BE765721, T66232, AI751085, AW674273, AA024662, BF197986, AI564218, AA319726,            AA657729, N64555, AA852211, C03119, AI221431, AA455496, AA033678, C04206, AI520867,            AA258397, AW867914, AW867908, AA382381, N24008, AA456579, AA936765, AI433202,            AA446297, AW338252, BF940540, AI075349, D31528, BE839377, AI537292, AA382234,            AI446798, BE839418, AA459088, BF724219, BE839363, BE773013, AI064722, AW375493,            AW375513, AW375482, AW375483, AW375502, AW370152, AW134700, BF352435, AW375514,            FI2285, BE772982, AW797394, BE839409, BE710069, AA299257, AI061637, BE773049,            AW375497, H63649, AW805832, H29954, AI587210, AW836298, BE773047, H75893, BF985423,            BF089372, AA610296, T73259, D30912, BE839372, BE934501, AW937287, AL531501, AI270416,         </p>
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	487	1307105	1 - 955	15 - 969	AW376140, AW838930, AI886158, AA375571, AL134647, H04943, BG006581, AW964941, AA336003, AA410897, R94988, W47433, R64321, D31541, W39467, AV693669, T82080, W04350, AA384793, AW572523, BE693478, AW375499, BF569459, AA428478, BF001215, H43934, AA382233, Z20767, AA382380, BE157468, W16893, BE066790, AW384231, BE157596, H80974, R96403, BE814079, AA345211, BG153436, AV654605, BE157507, AW292030, H62182, AW384236, AI382511, BF674009, AA335755, H25902, W65400, BG169442, AV710284, T64640, AA994712, BF944442, BF725435, BF726055, BF917617, W67868, H71581, AA326037, M14036.1, X07577.1, M13690.1, M13656.1, M13203.1, X54486.1, X07432.1, AB062098.1, X07431.1, AB062097.1, AB062096.1.
HSKHZ81	488	1307105	1 - 955	15 - 969	AI814274, BF869496, AI092236, AI275399, AI970748, AW381532, BF828729, BF828779, AI355259, AA055367, AA582963, BF825322, BE158757, BE158812, BE182090, BE182079, BE140770, BF737235, BE182110, BF836665, AW238620, BF828691, BF828827, AA055699, BE711192, BE717546, BF737527, BE140771, BF094219, BE158774, BF826017, BF838537, BE939669, AC002389.1.
HSLCQ82	488	1352226	1 - 1462	15 - 1476	BF116042, AA454571, AW192766, AI278160, H24834, AI091291, AA456465, AI242593, AA098966, AI379014, H24785, AA921986, BF745395.
HSLIG37	489	1016920	1 - 2112	15 - 2126	AI733659, AI792379, AI003110, BF931916, AC022608, AC022608, AC022608.
HSNAB12	490	542649	1 - 616	15 - 630	BE080230, BF508500, AC004837.1.
HSODE04	491	906081	1 - 1356	15 - 1370	BF369719, Z99289.1, AK027151.1, Z99289.
HSPBF70	492	793744	1 - 1383	15 - 1397	BF338332, BG178189, BE298379, AW772433, AI640184, AI751243, AI206927, AI989675, BF816124, AI439989, AI136304, AI128437, AI640906, AI136410, AI129952, AA341541, BE046990, AW382204, AW614497, BE004682, AI804666, BF327533, AI751242, BF327534, AW382118, AW992082, BE004684, AI689235, AI675842, AI274910, AI678921, AW082362, T10108, AI014513, AI538135, N47608, AI141309, AA885897, AI797519, AA652696, AI193489, AA872954, AI201747, AI244946, AI685761, AI810996, BF222389, N89795, AI224610, AI309547, AA513392, AA877674, AA894705, AA905637, AI056500, AW188156, AI138677, AI432328, AW466885, AI420740, AW873600, AI459017, AI047844, AI762549, AI382011, BF980675, T03552, T30150, AA917939, AI005050, AI797790, AI927908, BE857274, AA156935, AI453114, AI047845, H20185, AI140769, BF347892, F20400, AA628898, BE888983, AA928421, H05737, AW189222, AI860596, AA642494, AW058508, T70036, C00014, AA357087, AA731862, BF528632, AA742201, AA993626, AW873561, R39978, AI423668, H16241, AA983866, AI952326, BE152468, AI135012, AW858522, BF084778, AI134110, AW577199, AW601637, AI134524, AW577201, AI045327, AI045494, AI042523, BE927373, AW577192, AI045328, AI047163, AI042420, AI042468, U46344, AI042519, AE006467.1, AI031709.12, AK024842.1, AI136764.1, AI136762.1, AI133053.1, AI122101.1, AI136763.1, AI136758.1.
HSQCM10	493	638591	1 - 643	15 - 657	W60953, AA583014, AI991237, AA843374, AI379636, AA516473, AI741603, AA041475, AA191615, AI675441, AI950906, AI571559, AI191677, AW474205, AI087808, AI031945.

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HSSAJ29	494	630636	1 - 1030	15 - 1044	
HSSDX51	495	566879	1 - 1129	15 - 1143	
HSSFT08	496	589978	1 - 777	15 - 791	
HSSGDS2	497	1352343	1 - 2411	15 - 2425	

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HSSJC35	498	1306937	1 - 1160	15 - 1174	BE867020, AI478611, AW135035, AI796551, AI493335, AI763397, AI205153, AW452868, AW024931, AI770003, AI860167, AW300835, AW236836, AI039293, AA312699, AI033837, BE047902, BF196530, AI587364, AI700805, AI364782, AI631435, AW516669, AA461101, AA741034, AA310989, AA449433, AI671731, AI373338, BE464413, AI621029, AI989810, AI247252, AI478533, AA448924, BF092110, AK000413.1, AB058750.1, AL121845. 20.
HSTBJ86	499	753250	1 - 1752	15 - 1766	AA380166, AC008553.4, AP001572.3, AL354811.13, AP000802.4, AC010591.8, AL161897.6, AC012323.7, AC005883.14, AL359874. 9.
HSUBW09	500	413246	1 - 1007	15 - 1021	AI991103, AI765351, AA703513, BF939824, AI925701, AW295389, AW976578, AI199421, AI422698, AI934983, BE501421, AI127932, AA703493, AW297092, AA677025, AA848037, AA814098, AW404152, AW904298, AW182186, AW197850, AA741121, AA651794, AI678148, AA906044, F18680, AA743764, AI632270, AW590435, BE045258, AA608892.
HSVAM10	501	520328	1 - 419	15 - 433	AI654853.
HSVBU91	502	596868	1 - 713	15 - 727	AW839808, AA077633, BF919965, AC008171.3, AF041056.1, AC004089.25, AC005081.3, AC005015.2, AB006629. 2.
HSXCG83	503	944388	1 - 2098	15 - 2112	BF541621, AI926957, AI741909, AA534993, AI435345, AI803123, D82268, N34976, AW167331, AI093828, BF037342, AI140410, AA588188, BF349607, AI287515, AA844074, AA706579, AA759372, AI198783, H78775, AI261392, AI480026, AI027233, AA255439, BF800502, AA256930, AI928179, AW192517, AW961173, AA307508, BE143874, BE765577, BE765574, BE766269, R11616, AI399819, BF752821, AW853138, AW352290, BF752819, BF752822, AW352288, AW352272, BF349404, AW352292, BF752834, AW352275, BE869822, AL119319, Z99396, AW979284, AW970958, AW971965, AW975987, AL037094, AW979004, AW973808, AL036858, AW970564, AW969751, AW979210, AW972857, AW970978, AL036924, AW979140, AW972226, AW979252, AW976039, AW971981, BF868687, AW975126, AW973830, AW975247.



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HSXEC75	504	634032	1 - 1098	15 - 1112	<p>BF792631, BG167198, AL654054, AL532790, AA777790, AW118831, AI807933, AI750036, AW149710, AI922319, AU154480, BE501717, AV647941, AI220354, AA954881, AA037461, AI369003, AW021718, AA446479, AA812671, BF130437, AI796412, D62485, Z39900, AI978951, AA852817, AA383343, AI184697, R43365, Z43835, BE540095, AW957406, AL039953, AL133477.16, AC004899.1, AC009597.5, AC013471.7, AC006024.1, AF064104.1, AC006344.2.</p>
HSXEQ06	505	1016924	1 - 1584	15 - 1598	<p>BG171665, BG109746, BE005933, BG026351, AI670834, AI793031, AW996511, AA481590, BF791148, BF110900, AA884278, AI554009, AA418164, AW966701, AI287582, N39228, AA177106, AA773834, AA233042, AI366763, AA417913, BF327654, AA232936, AW085026, N35014, R46292, FI2643, BF947218, AA953139, AV732449, AV660624, Z43417, R54534, AI249382, AI817549, H53484, T34371, T32748, BE762828, AI268132, H26220, F08007, AA976991, Z39490, N72112, F03527, F04961, AA357869, H99278, FI0258, R81334, R37424, AV734143, F07252, T74533, AA976568, R54437, AI433026, AW611733, N46671, HI3274, N46079, AA481525, D62268, AA360677, H08120, R6918, R76039, BF830437, AA296802, BE811300, W00375, N43768, H93364, N46077, BE718145, AI559424, N72148, AA029181,</p>

					AA743316, H08119, F36454, AA361446, AW890129, BE831170, AW063750, T77292, W00419, AL135691, AA057340, H86888, AA044960, H38947, BF891014, BE718142, D20601, AW293865, AF007142.1, AC024581.3, AL356017.3, AL356017, AL356017, AL390254, AL390254.
HSYAV50	506	847358	1 - 2787	15 - 2801	BF313680, BE742185, BE388304, BE741869, BF526599, BE619099, AI341487, AI971709, AI623222, AW593800, AW959076, AI983635, AI952104, AW275114, AI800442, AA977038, AW513859, AW273202, AW337946, AW273147, AI801910, BE463718, AA250733, AW072844, AI453134, AI818468, AI086791, BF329916, AW166266, AW300481, AI561259, AW103087, BE048584, BE907359, AW470887, BF063936, AI207341, AW235230, AA448721, AW206033, AW175624, AW193322, AW193240, AI128968, AW264492, AA410939, AI682412, AA455784, BF525380, AI631778, AW771868, AI669677, BE619620, AI128695, AA448630, AA456607, AW239315, AW195959, AI825128, AA327876, AI168173, BF376618, N79049, AA349394, AI470892, BF194812, D79030, AA902669, AI569983, AI682120, AA385255, AI052433, AI948815, W24199, AI735600, W24193, AI214684, AA770139, AI672486, AA769789, N91773, BF944570, C02034, AI955870, AC005222. 1.
HSYAV66	507	686437	1 - 1393	15 - 1407	BF036117, AF126372. 1.
HSYAZ50	508	1027673	1 - 1083	15 - 1097	BF918029, BF918027, BF732372, AW028622, H58607, BF9335019, AW471489, AV707971, AV709796, AF168681.1, AC007378.4, AC007378, AC007378, AC073041, AC073041.
HSYAZ63	509	1177537	1 - 3452	15 - 3466	AV722966, BE388876, AV760983, AV762946, BF185935, AV762161, BF108823, AV759946, AV761323, BF064074, BF689470, BF001385, AI970338, AL046433, AI348109, BE349503, AI819289, AI090048, AW305162, AI857825, AA551911, AI963412, BF690404, N90883, AI652494, BG055077, AA311166, BE502539, AI200346, AA158746, AA502649, AW083258, BE551410, AV763075, W04340, AA150467, F29360, BF436259, AA040295, F21409, BF344822, R86673, AW206720, AI961780, W79500, AI831018, AA514281, AA609867, T67539, W79599, F25102, AA807108, AI351521, F36686, BE164504, AA056972, BF917215, F24355, W16820, AA513661, F30483, AI349360, AI805040, AA532766, AW590360, AI962009, AI817647, BE140360, AI720757, BG236085, T64334, AI400242, AI832241, R86847, BF741663, AI383420, N74174, T65686, N92928, AA584402, AW138172, AA297326, BE170117, AA359080, AL515041, AL515035, AL513867, AL515375, AL040243, AL513907, AL514303, AI540832, BE905408, AI433976, BG179993, BF883916, BG260037, AV681987, AW274192, BG257535, BG036520, BF793644, AL135661, BE048026, BF525438, AV657079, AI475371, BF037097, BG031815, BE964812, BG108147, AV715263, AL121270, AI702406, AI687728, AI863014, AL513911, AI439087, BE887488, BF340104, AV755678, BF812933, AL046849, BE048071, AV655645, AW071417, AI440239, BG036846, AL514627, BE876033, BG032208, AI224992, AI250293, AI497733, BE904178, BE877769, AL513553, BE047952, AI433157, BF968041, AL513597, AI064830, BE018334, AV757705, AV705644, AI802542, BE881061, AI349772, AV681638, AV755581, AW071349, AI349933, BF344507, BE047863, AL045500, AI499393, AI758437, AI521012.

BE781369, AL513803, AW195957, AI613017, AL036146, AI678302, AI568870, AI499463, AI249257, AW301409, AW103371, BF724691, AL513753, BG180996, AL514919, AI702433, AL513837, AV681630, AL047763, AV682252, AV758110, BF792469, AI868831, AI275175, BF969494, AI635461, AI498579, AI625079, AL036802, BF795712, AL515173, BE048135, BF791952, AW827203, AI538716, AL513693, AI285735, AW268253, BE785905, AW827249, AI564719, BE963035, BF971016, BG109270, AI620284, BE048081, BE964700, AI866608, BG168696, AV729334, AL119791, AV756560, BG252929, BG105099, BF968493, BE172767, AW117882, AV681951, BF726001, AV682249, BE777769, BG104371, AL513905, AV682266, AW238730, AL048871, AV682479, AV757455, AI800453, AI800433, BG058208, AV682264, AI934036, AI633419, AV757737, BE966388, AI866002, AI499131, AV681618, BG151247, AW169653, AW074993, AI612913, AI349645, AL121365, AV757853, AI349004, AV755613, AL514129, AW162071, BF970446, AF113615.1, AC040160.4, AK025992.1, U23861.1, AF090901.1, AF090900.1, AF090934.1, AL157431.1, AL136892.1, AL442082.1, AL110221.1, BC008365.1, AL117457.1, AL136586.1, AL133075.1, AL136787.1, BC008387.1, AB056420.1, AB055303.1, S78214.1, BC007021.1, AL050393.1, AL389978.1, BC008488.1, AL050116.1, AL512733.1, AL080060.1, AF090903.1, AL442072.1, AL133640.1, BC008417.1, AF104032.1, AF078844.1, AL110196.1, AL390167.1, AL117460.1, AF125949.1, AL137527.1, AK026608.1, AL133016.1, BC003687.1, AL050149.1, AL162083.1, AF090943.1, AB048953.1, BC003683.1, AL049452.1, AF218014.1, AB049758.1, AL359596.1, AK026865.1, AJ242859.1, AL359601.1, AL133606.1, AB048964.1, AF111847.1, AK026784.1, AK026741.1, AB060916.1, AL050146.1, AK000212.1, AK025339.1, AL136749.1, AB056768.1, AL049938.1, AL136789.1, AB063046.1, AB055361.1, AF106862.1, AF090896.1, AB060887.1, AL050108.1, AB047615.1, AB063008.1, U42766.1, AK026045.1, AB056809.1, BC006807.1, AL122050.1, AB019565.1, AL133258.16, AB063070.1, AK025958.1, AB047801.1, BC001967.1, AL162006.1, AL136799.1, AK025084.1, AL133557.1, AL049466.1, AL049314.1, AL080137.1, AL359615.1, AK027868.1, AF219137.1, AL122093.1, AL136844.1, AL389982.1, AK026855.1, AL080124.1, AL512746.1, AL137283.1, AB060863.1, AB050510.1, AK026744.1, AL050277.1, AB060912.1, AL096744.1, AL133080.1, AL133093.1, AK025772.1, Y16645.1, AL137557.1, AB060908.1, AL122123.1, AL136768.1, AL050138.1, AL133565.1, AL122121.1, AK027096.1, AK026592.1, BC002733.1, AL137459.1, AF146568.1, AK026533.1, AK000618.1, AL359618.1, AF207829.1, BC008280.1, AL049382.1, AF125948.1, AK000137.1, AL353940.1, AK000083.1, AL512718.1, AL049430.1, AF271350.1, AL117394.1, AF091084.1, AK000445.1, AL137550.1, AL359941.1, AL512754.1, AK025092.1, AB062938.1, AK026452.1, X82434.1, U91329.1, AC007375.6, AK026583.1, BC008485.1, AL133344.28, AL110225.1, AB048954.1, AB060826.1, BC004556.1, AK000614.1, AF097996.1,				
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HSYBG37	510	1056317	1 - 1224	15 - 1238	BC006195.1, AL512719.1, AK025491.1, AK000652.1, AK026627.1, BC001045.1, AB055368.1, AB060825.1, AB051158.1, AF183393.1, AK026647.1, AB055315.1, AB060852.1, AK026542.1, AK026534.1, AK026480.1, AK024538.1, AL117435.1, AF225424.1, AL353745.7, AC026464.6, AB055366.1, AL117585.1, AB052191.1, AL117583.1, AB047904.1, BC002839.1, AL133560.1, AK026504.1, AK026959.1, AF177336.1, AP001346.1, AL512765.1, AC084881.19, AK076532.1, AK027113.1, AK000432.1, S61953.1, BC008983.1, AL136928.1, AB052200.1, AC009364.8, AL049464.1, AL158191.17, AL049300.1, AK000323.1, AK026353.1, AK026927.1, AC018643.3, AL050024.1, AL512883.5, AB056421.1, AK025414.1, AL512689.1, AP001666.1, AL512684.1, AB048974.1, BC007199.1, AL122110.1, BC008899.1, AL136845.1, AK025391.1, BC008070.1, AK026086.1, AK025967.1, AL353594.13, Z82022.1, BC004951.1, AK026528.1, AB049892.1, AK027204.1, AL353625.5, AK000718.1, AL355795.13, AL359583.1, AK027164.1, AL122098.1, AL889193.
					BE898532, BF034673, BF337228, BF528632, BE857436, BE732588, BF527968, BE888983, BG033426, AW372231, AA156935, BF915018, AV690944, AI140769, AW068552, AI818102, AI870885, AA135715, AA928421, AL047844, AI927908, AI762549, AL047845, AI797790, AI005050, AA917939, AW873600, AI453114, AI420740, AW460685, AI432328, AI138677, AW188156, AW873561, BF980675, AW058508, BF770293, AA628898, AI094804, AI056500, BF820729, AI375863, BE857274, AW959629, AA905637, AI382011, AI860596, AA877674, AA513392, AI459017, W73121, AI242677, AI309547, BF819613, H16241, T70036, AA642494, AI675842, T03552, AI689235, BF919604, AI274910, AV748307, C00014, AI678921, AA993626, AI201747, AA742201, BF351125, BF770277, AW082362, BF914643, T30150, AI014513, R93245, H83130, AI538135, AI244946, AI952326, N45499, BF344569, AI685761, H05737, F20400, BF914807, AI094715, AI810996, AA320821, BF222389, H20376, H20185, H83129, T10108, AA370998, H12111, T70103, BF919644, AI800313, R47434, AI557606, AA299558, BF983106, BF347892, N47608, BF590090, AI141309, BF915129, AW385116, AA885897, BF917925, BF917920, N89795, AI797519, AA652696, AI193489, AA894705, T10109, AW189222, BF350004, BE829911, AI224610, AI423668, AA872954, AI207820, R39978, AI989675, AI439989, AI640906, BE046990, AI206927, AA136304, AW614497, AI751243, AA128437, AW772433, AI640184, AW385115, BF326281, W39052, AA595730, BF088390, AA731862, BF338332, BF111399, BF770143, BE767158, AA983866, AF302786.1, AE006467.1, AL031709.12, AK024842.1, AW298370, AI433823, AI239867, D62170, D61860, AF329839.1, AC007016.5.
HSZAF47	511	1352172	1 - 1290	15 - 1304	U69197, BE889880, AV707406, BG256172, BE379687, BE380123, BF691342, AV695897, BG259259, BF183831, BF984932, BE348298, BE813737, BF671812, BE837505, AL528978, BE966164, BF447947, BF540997, AA889669, AI983007, AA191622, BF131956, AI819766, AA427366, AI802592, BF217999, BG260695, BE042598, BF218184, AV700494, N31181, H16250, H11397, BF572925, AW952360, AA846829, AW874257, AI190464, AA157806, AI925182,
HT3SF53	512	884170	1 - 1912	15 - 1926	

					<p>BF952221, AI472734, BE888420, AA903609, AW169049, AW015713, AA033780, AA034036, AA609322, AI424168, BF219352, BE328721, AI333376, AW882963, AI362641, AW197207, AA910279, AI557117, AI308825, AA847184, N71642, AI433939, AW263961, N45294, W01668, BE856264, AA907298, T15527, T89105, AA658226, AW576192, BF195028, AA594141, AW183696, N22707, AA931425, W03486, AW105669, AI419995, AI740524, AW194431, AI340359, BF944106, BG030457, AI135266, AI160287, AI017580, AA361043, BG179629, AW166420, AA903241, AL044093, AA364671, AA858303, AW069464, AL044094, AA610333, AI216722, BF983099, AI803720, BF084671, T35050, AI864144, BF221793, BE170395, T30766, AI921819, BF361447, AI160286, AI190687, AA074277, N51259, R33551, F10050, Z45902, AA135312, H16449, BF882016, AA427905, N54743, AI814813, W28253, AA541311, H96787, BE765518, BE770902, BE810330, AA904093, AA747271, AW877284, AW581619, AA207148, AW090441, AA669068, AI963361, AI268881, AI061243, AI150891, T94142, AA135198, AA206434, BF594187, AA593048, BF931525, AA319228, AW366804, AA135111, Z41528, AI135106, AW272442, AW972911, AI262450, T10553, AA043331, D20243, AA090084, T11277, AI138341, AV705048, AA343747, T31173, N67513, N66837, AI383429, AW877286, R00189, AI868926, BE766096, BE766172, BE674157, BF084152, AA216135, AI097209, AA578579, AA886271, T31172, AA043332, BF802755, BF808023, T39112, BE962266, T06248, AW384062, BF964474, AI160470, BF361446, T94064, AI970644, AI687569, AW021379, BE089866, T74327, BE149777, AI799396, AA620459, AW069630, AA741223, R23931, AA704085, AA588415, AA613110, AI917566, BE439382, BF932443, AI277023, BF837456, H17179, BF238717, AI873497, BE834188, AI445175, AW886754, AA218774, BF953692, AK025519, AF061938, AF061939, AF061940, AF061941, AI132258, AI136601, AI133174, BC000830, I.</p>
HTSGJ57	513	1299921	1 - 1759	15 - 1773	<p>BF975647, AW574516, BG259057, BE397179, BE396519, AW575080, BF795582, BF663664, AI521311, AW237047, AI446257, AI862389, BE559713, BF128855, AI573063, BF238156, AW296989, AU157608, AA811488, AA827120, AW338778, AI439638, AI250231, AI312540, AA633095, AV742373, AI343438, BE513368, AA604586, AI669176, AI149413, AW732709, AA723128, AW403042, BE269253, BE560794, AA722908, W57991, AI826124, BE246032, BG120258, AU138425, BE513265, AI865336, AI219708, AI589599, H23560, AA765412, AI589912, T61448, BE247378, BE560732, AW444827, AA594614, AA361096, AA648496, N34423, AV743440, W58075, N48728, AV742389, AA975334, AA731435, AA166766, AA810638, AW298682, AI919140, AI341517, BE245894, AI962720, BF062274, T30849, AW402333, AI982795, T25945, AA810222, AA807717, Z39117, AV756294, N48658, AW405561, AV724221, BG120887, AA593214, AW083122, AA639378, AI492348, H23535, AI656821, AF252613, BC009204, BC001609, AF252611, AF252614, AK002099, AF257135, AF252612, AF045555, BC006080, AC005081, AF086239, I.</p>
HTADX17	514	753289	1 - 1133	15 - 1147	<p>AA446344, AA612751, AA298785, AA298780, AA298784, AA446524, AA298781, AA381170.</p>

HTDAF28	515	396835	1 - 898	15 - 912	
					AI760170, AI150687, BF829200, AU158613, BF809865, AW273858, BE312404, BF316832, AU148518, BF314749, AU149720, BF315081, AI400198, AW062695, AI924082, BF314377, AW087415, BE047624, AI689214, AI684707, AA526748, BF315285, BE262228, AI566857, AI377786, AW167628, R65808, AA525309, R32753, AW663929, AI242434, BF206474, AI927229, R32754, AI956002, AI927230, AI701965, AU156607, BF349416, AW292033, AI368435, AA897436, BE314877, AI221593, AI612972, AI364630, BE185584, BF354201, AF352728.1, AF352729.1, AK022603. 1.
HTEAF65	516	866485	1 - 549	15 - 563	AA778552, AI201364, AI150012, AA876180, AI223025, AW663435, AW304049, AW663514, AA978197, AI223459, AA903410, AA382504, AA864517, AI352610, AF012359, AA868778, AW102794, AW058243, AI513723, AI921248, AI513907, AL514015, F36855, BF792781, AI978703, AI538885, AI811603, AW131994, AL514721, AV736808, AA190341, AL118781, AI863466, AI250852, BE966927, AW827206, AI890907, AI049669, AL514867, AI538850, AI677797, AL039783, AI345688, BE011880, AI241744, AI571699, AI571909, AI560099, AW078650, AI866624, AI950100, AI690946, BG121335, AI932503, AL514689, AL036509, BF971336, AI446248, AW083804, AI081740, AI623941, BE965121, BE964576, AV647670, AI860027, AL514493, AA514684, AI491904, BE252769, AA693355, AW081242, BE965230, AI334893, AL514359, AI925196, BG110241, AI453328, AL513951, AI961286, BE963777, AI364135, AA767211, BG113188, AI824444, BE139128, AA937566, AI280747, AA744531, BE785348, AW131065, AI866798, AI565062, AW827290, AI524654, AL048323, AI866461, AI934039, AI579979, AI799158, AL048340, AI287489, AV681618, AI858310, AI690813, BE962857, AI440238, AI312428, AV724929, AI538764, AI927233, AI831308, H89138, AA844225, BE880209, AA580663, AI678446, AL513553, F34800, AW083750, BF680133, AW130356, AI310575, AI340603, AI633061, AI335363, AI538247, BG168054, BF764538, AI373276, BG029457, AI640799, AI360195, AI887775, AI273856, AI310606, AW189196, AI340533, AL514205, AW022636, BG250746, AL038505, AW151943, AI932915, AW190297, AI815855, AI401697, AW129659, BG024570, AL047763, BG180046, BG109270, AI933574, AI524179, AL513977, AA746619, AI922215, AL514791, AI624475, AI866465, AI539560, AI682958, AI022908, AL036403, BE964147, AW827103, AI926333, AI673278, AI961589, AW190808, AL514691, AW023590, AI307494, AL046849, AI343091, AL513817, AV755821, AW023338, AV758110, AA575874, AI634224, AI859991, AI932794, BG114012, AI476021, AI423326, AL514409, AV682867, AW022102, AL046942, AW059713, BF531023, AW118477, AI345736, AW402571, BG029053, AI573171, AV682218, AW163834, AI619607, AI624548, AI362522, BE873838, AW834282, AI963193, BE910373, AV743129, BE890041, BE964994, AL049085, AI582932, AI890887, AI638644, BF035924, AI681985, AI254226, AI983457, AI953852, AI610667, BE843239, AI491775, AI274768, N29277, AI335208, AI828574, AI804983, AI523806, AI383804, BF814447, AI690738, AI590781, AI559752, AV756026, BE964997, BF965523, AW149268, AI521244, AV681837, AI312210, AA764946, AI636456, AI379711, BC006132.1.

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HTEB128	517	462221	1 - 399	15 - 413		AW966413, AW444815, AI635348, AI146654, BF508527, AA789269, AI990377, BE502159, AA298815, TI91416, AA834912, AA933749, AA934558, AA970840, AA298819, BF092040, AL121751.12.
HTEDF80	518	587326	1 - 1292	15 - 1306		AA952940, AV719708, D45556, AA709370, AW628803, AI766729, AW966053, AW978634, Z21582, AW975618, AV718489, D80949, D80227, AV699447, T03269, AW966531, AW966534, D80269, D80253, C75259, D51799, AV722801, D58283, AV719557, AW959628, D80166, AV699550, AV718692, AV719822, AW978661, AV699927, D51423, D59619, AV720731, AW960553, D59859, D80210, D80240, AV719188, AW959570, D80212, AW973307, AV719324, D80188, D80195, D81030, D80391, AW975621, D51079, AV720211, D59889, D80219, AV720203, AV723927, D80196, AW966062, AW966054, D80366, AW949656, AW949642, AV718440, AV719783, AV720028, AW965177, AV718800, D59927, AV718844, AV720464, AV718770, AW966013, D80043, AV724520, AW965158, D80378, AW966041, D80193, D80038, AW959582, AV719468, AW959202, AV721386, AW949645, AW949631, AW949643, AW949657, C14429, AV744011, AW949629, AV721386, AW949653, AW959597, AW966043, D57483, D80022, AW973447, AW949641, AW949633, AW949632, AW949618, AW966050, AV720812, F13647, D59275, D80241, AV700889, D59610, AV723097, AV718633, AW975603, AV720654, AW949646, AW949658, AV720791, AW949655, AW949654, AV742001, AV742667, AV701125, D80045, AV701335, AV701166, AV701043, AV701332, AV701017, AV701248, AV742048, AV701431, C14014, AW964488, D80134, AV701419, D59502, AV645389, AV742430, AV701154, AV699682, AW964737, AW959469, AV701443, AV745080, AV699669, AV701130, AV701149, AV645344, AV701422, AV719628, AV681510, AV681491, AV701415, AV701344, AW966560, AV701428, AW973470, AV681529, AV645343, AV721784, AV718674, AV701021, AW960474, AV681468, AV645383, AV645393, AV681528, AV681474, AV645339, AV681472, AV743601, AV681507, AV681465, AV681525, AV681495, AL390084.1, AF271371.1, X67155.2, D34614.1, D88547.1, AB033111.1.
HTEDY42	519	1352193	1 - 740	15 - 754		AA393537, AI187279, AA889534, AW002667, AA421499, AW003587, AA421468, AA709184, AW772510, AA397830.
HTEFU65	520	543396	1 - 1014	15 - 1028		AW072387, R83559, AI924465, AI364031, AW513660, BF361111, AA705541, AL162032.1.
HTEGI42	521	908143	1 - 964	15 - 978		BF792295, AW118908, AW956740, AA805770, AA578718, AA805757, AA808355, AA805773, N29112, AI760734, AI005113, AI204164, N21153, AI004282, AW956741, AI001990, BE564602, AI538204, AI188040, AI301191, AA383104, AW182071, AI192033, BE168090, AA861920, N31710, AA887975, AA976455, BF812960, AI249323, AI619607, AI961286, AI819976, AI567612, AI632033, AI554821, AI934036, AI538116, AI251434, BE964614, BF826445, AW105601, AI818980, AI926790, H89138, AI269862, AI288285, AW079075, AI280747, AW055252, AI621362, AV648430, AI590423, AW054931, AI538885, AI609556, AA455772.



AI824764, AI670009, AI280637, AI277255, BE965432, AW168650, AI801523, AI955906, AI312428, AI916419, AI573038, AA527133, AI340603, AI801323, AI609409, AI871923, AI817543, AI680388, AI310575, AI591311, AI612885, AI340533, AV707062, AI134598, BE965121, AI582932, AI648663, AI801544, AW084869, BE895585, AI610362, AI784252, AW167776, AI569583, AI862144, BG258298, AI538218, AL039276, AW827285, BE965621, AI247193, AV738991, BF791806, AW148457, AI572787, AW022682, AI917253, AI121365, AI873644, AI969641, AI273142, AI281837, AI587143, AI571046, AW193000, AW081036, AI918655, AW167410, AW169039, AI589267, AI431408, AI913330, BF812961, BE048081, AI251221, AI653840, AW152459, BG255895, AI560099, BF812938, BF816042, AW131428, AV703695, BE910373, AI634224, AI452876, AW169653, AI497733, AI866798, AI917123, AI439443, AW198090, AI559752, AL036980, AI608667, AW945539, BG254754, AW834325, AI888953, AI654601, AW089350, AW084447, BF813196, AW193134, AL120853, AL134999, AI694157, AA420722, AI887308, AW020693, BE047833, AI334893, AI620015, AW827207, BG163618, AW169149, AW081449, AI866770, AL036631, AV682227, AI270055, AI285735, AI633125, BG256592, AI670849, BE964497, AI539808, AW192701, AW168718, AI340627, BE970652, AW150273, AI568855, AI887450, AI498067, AI625094, AI670002, BG121959, BG029829, AI890806, AI612721, AW081298, AI801325, AI446373, AI890223, BF884999, AI038605, BE965471, AL13687, BE963085, AI570884, AI923989, AI284517, BE972174, AI963193, AV714036, AI818977, AI269205, AW268253, AW301300, BE966305, AI349598, AV726784, BE966699, AI302910, BE879911, AW075207, AL036664, AA579232, AI554344, AI627360, AW087932, AV702147, AI345735, BE886728, AL136571.1, AC004006.1, BC004370.1, AK026542.1, AF090943.1, AL133031.1, BC002733.1, AK026741.1, AL136754.1, BC004119.1, AF261134.1, AF056191.1, U42766.1, AB047904.1, AK024538.1, AL137521.1, AF091084.1, X82434.1, AB060825.1, AL050149.1, AF061943.1, AK026593.1, AL049938.1, AK000432.1, AB056421.1, BC001045.1, AL136845.1, AK027096.1, AK025967.1, BC006180.1, AK027164.1, AK026526.1, AK026631.1, AB060229.1, AL136622.1, AB062942.1, BC008899.1, AK026959.1, AL512765.1, AL122050.1, AK024974.1, AL050155.1, AL162083.1, AL049452.1, AK027204.1, AL133557.1, BC003548.1, AB052200.1, AL389947.1, AF260566.1, AL110280.1, AK026408.1, AL122049.1, AK000083.1, AK027213.1, AB048964.1, AK026613.1, AL442082.1, AB062750.1, AL133560.1, BC007326.1, AK026894.1, BC004899.1, AK026744.1, AF090903.1, BC001056.1, AK024622.1, AL050108.1, AJ010277.1, BC004556.1, BC007199.1, AK026629.1, AK026534.1, Z82022.1, AF120268.1, AL117460.1, AL137550.1, AL049426.1, AL137463.1, AB051158.1, AB060893.1, AK026522.1, AK026855.1, BC008485.1, BC008719.1, AL133075.1, AL117457.1, AL050116.1, AF125948.1, AL136892.1, BC006807.1, AK024524.1, BC008488.1, AK026504.1, AF097996.1, AL049430.1, BC002485.1, BC005168.1, AB063046.1, AK025092.1, AL137538.1, AL117649.1,				
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HTELM16	528	834058	1 - 517	15 - 531	
HTEPG70	529	834931	1 - 799	15 - 813	
HTGAU75	530	597467	1 - 1699	15 - 1713	
HTGEP89	531	410582	1 - 689	15 - 703	
HTHBG43	532	919911	1 - 834	15 - 848	

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HTHCA18	533	908144	1 - 1804	15 - 1818
HTHJD94	534	693652	1 - 1618	15 - 1632
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HTHDS25	535	772559	1 - 1047	15 - 1061	AI801504, AA385855, AA812703, AA349881, AL254831, AW293292, AI963714, BF674168, AW967329, BE241437, T08386, AL521458, BF855114, AL357075.17, AL031668.23, AL358976.11, AP000067.1, AC004089.25, AL357519.19, AC005015.2, AL034417.14, AC004491.1, AC004962.1, AL133353.6, AC004634.1, AC022027.5, AC060231.6, AC004084.1, AB043547.1, AP000304.1, AL139390.15, AP000047.1, AL080243.21, AC004841.2, AL035685.21, AP000115.1, AC008957.7, AL035684.25, AP001717.1, AC015982.9, AC020916.7, AL139230.25, AL096773.6, AL137073.13, Z85996.1, AC010386.5, AC005098.2, AC003010.1, AC004166.12, AC005488.2, AC012170.6, AC005972.1, AC008507.8, AC008569.6, AL049198.2, AL133354.14, AL357507.9, AC008771.4, AB014077.1, AC011479.6, AC079171.21, AC004156.1, AL157823.9, AL356464.15, AL138976.5, AC002126.1, AL133507.8, AL024498.12, AC008766.4, AC020904.6, AL035073.7, U91323.1, AC005103.3, AL078633.32, AF047825.1.
HTJMA95	536	706618	1 - 1636	15 - 1650	AI608603, BE140256, AW872982, BF832764, AW352295, AI767967, AW085774, AW238519, AA863266, AW606064, AW117932, AI310728, BF105292, BF350121, BF825661, AW772195, AA865790, BE889218, AA864183, BF354847, BF832729, BF832728, BF354850, BF350182, BF354844, AI141812, BF354848, AI355569, AA595971, BF354846, BE350405, BF825662, BF353627, AW080463, BF353788, U75833, BF736474, BE141732, BE141331, AF193809.1, AF081497.1, AF284446.1, AF185277.1, AF219986.1, AF219985.1, AF219984.1, AF219983.1.
HTJML75	537	1040047	1 - 2748	15 - 2762	AL521803, AL521804, AL535427, BE397366, BE562398, BF974996, BE561712, BE744093, BE397614, BE271237, BE562082, BE397567, BE275147, BE734376, BE409602, BE514409, BE561529, BE561508, AL535426, BE513947, BE269836, BE397322, BF025695, BE730298, BE397518, AW024974, AW303401, BE270550, BE277764, BE304392, BE747750, AW954868, AW954834, BE397865, BG104371, BF125819, BF892698, BE207701, BE296686, BE397490, BE271132, BE207727, AI274799, AW074233, AI679074, BE391918, AW732734, BE562087, AI499422, AI827575, AI928361, AA160606, BE267895, BF002414, AA315776, BE547421, BE644853, AV696893, AV684921, AW450819, BE268902, AI016059, AW249651, BF155203, BF437505, AL527262, AW079518, AI365272, AI338083, AA729126, AA831884, AI440443.

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HTLBE23	538	902187	1 - 1202	15 - 1216
HTLFE42	539	460583	1 - 698	15 - 712
HTLFE57	540	1352310	1 - 2234	15 - 2248



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HTLGE31	541	1035130	1 - 520	15 - 534	AA714179, AW051497, AI971919, AI094911, AW055123, AA293722, AI094408, AA631985, AL445222.9, Y17801.1, AJ245937. I.
HTLHY14	542	838460	1 - 1018	15 - 1032	AW182303, BF530991, AA885453, AA913620, AI024359, AI218809, AA436925, AA904573, AA729136, AA448181, AA431731, AI768931, AI138595, AA868685, AV721013, AI191602, AA970192, AI004977, H19402, AA496009, T19190, AI024060, AI015490, AA860370, AW081876, T05239, AA810634, AA609572, AA824562, AA789135, AA904853, AC005328.1, AC005545. I.
HTLIT32	543	833906	1 - 1060	15 - 1074	AA430173, AA813342, AI688054, AI656828, AA431616, AI014589, AA446480, AI335754, AA759304, AW340541, AA912641, AA923430, AA431328, AA725624, AC020956.6, AC010616.5.
HTLIV19	544	1046341	1 - 964	15 - 978	H73550, AA715075, AA425924, AI792525, AA303049, AA715173, BF895531, AW086361, AV733366, AI348722, BE168680, BF880342, BF725844, BE464794, AI862231, AL033519.42, AL138706.9, Z82244.1, AC004000.1, L78810.1, AP002453.3, AL117382.28, AC004491.1, AC005399.19, AL354798.13, AC004867.5, AL022326.1, AC006160.9, AC004805.1, AC018801.4, AC022007.3, AL133444.4, AL356481.16, AL121751.12, AC008687.4, AC002369.1, AL353668.18, AC011495.6, AF279660.2, AL132640.4, AC004263.1, AC009077.7, AC005105.2, AL450169.1, AC025262.27, AC007425.16, AL050349.27, AC004887.2, AL022396.1, AC040160.4, AC018642.6, AP002340.3, AC074331.1.

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HTNBO91	545	519313	1 - 286	15 - 300	AW194713, AJ911340, AA601540, AL434870, AI810614, AA975093, AI026153, AW594027, BE502581, AW151600, AW196248, AW627679, AI669568, AA976768, BF437810, BF439076, AA975123, AI749464, AW966620, Z19502, AW196675, BE465426, BG120409, AA385366, BE221802, BE697980, N55869, AW631460, AK000497.1, AL136231.12, AB050415.1, AK000646. 1.
HTOAK16	546	560744	1 - 1452	15 - 1466	AU145310, AW274654, BF838423, AW139789, AW205436, AA017033, AU118838, T87405, AI143925, AI174470, T87300, AA019253, AK021714. 1.
HTODK73	547	526021	1 - 1005	15 - 1019	AI347130, AW027513, AW954660, AI660559, BF063427, BG230588, AI340321, AU155474, AI214222, AW006987, AI803717, AW301687, BE221184, AW016409, AA018238, AA019155, AI336534, AA015924, AI283525, AA921711, AA307210, AI090373, AA878131, AI269256, BF761125, AA017114, AI857978, BF229860, BG030487, AI368031, H84864, R84448, AW403382, AI367923, AW900223, AI284356, AI080385, AI350788, F29712, BE251142, AL536301, AA987803, BF761104, BF808782, AA017329, AA018635, BF593228, AA534529, BF851700, AL536302, W21988, BE910304, AA280994, AB031051.1, AL357033.19, AF205072.1, AK000551.1, AF104334.1, AK023410.1, AF187817. 1.
HTODO72	548	532001	1 - 959	15 - 973	AI401101, AI801654, AC005628. 4.
HTOGR42	549	838160	1 - 1416	15 - 1430	AA573067, H30513, AI266619, R20206, AW084004, AI064724, AW851828, BF031134, AA773890, AA507343, AL031295.1, AL355343.18, AC005031.1, AL354932.26, AC044797.5, AL356019.5, AC011994.10, AL034420.16, U04060.1, AL031281.6, AC022392.4, AC073657.5, Z99716.4, AF196779.1, AC009144.5, L44140.1, AC008440.8, AL049776.3, AL031847.17, AC010378.6, AL136418.4, AL139054.1, AC004797.1, AL353777.18, AL117382.28, AC005231.2, AC008521.5, AC002425.1, AC011446.6, AB023048.1, AL139113.21, AL355480.22, Z97196.1, AC008753.8, AL031685.18, AL160271.19, AL109952.15, AC004999.1, AC021012.5, AL355093.3, AL512883.5, AC007055.3, AF001550.1, Z95115.1, AC008745.6, AL021579.1, AL136304.10, AL121886.22.

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HTOHD42	550	604983	1 - 932	15 - 946	AA429294, AI085609, AW664590.
HTOHD15	551	1028538	1 - 1935	15 - 1949	AL118824, AA573022, AI754263, BE675104, AW272936, AI339372, BE349264, AA767823, AI379332, AI568638, BG057649, BE857312, AI870434, AI424042, AI203588, AI338543, AW080903, AI350585, AI827956, AI874102, AI304572, AW675567, AW029133, AA456303, AI885625, AA993567, AI028262, BF975457, AA808518, AW275811, AI086981, AA046802, BF478308, AV744983, AI869215, AA641617, AU157068, AI924628, BF594893, AW571905, AI146641, AI863164, AI214585, AI261778, AI492622, AW089250, BE207445, AA937376, AA830286, AA836878, W80372, AI023344, BE220743, AA418367, AI091921, AI885685, AA161459, AW134967, AA605225, AA725880, AW275980, AW248464, AA774650, AI991146, F09607, AA707150, AA593400, W17197, AI721238, AW073192, AA621167, AA908648, AI814647, R08844, AA290839, BE706675, AA100200, AA004650, AA285017, T65581, AA733113, AA405078, H19750, H53457, AA765557, AW383354, AI923502, AW615521, N95096, H50501, H24958, BF924331, H52806, BF771262, H02315, N92953, BE695264, N73135, BE695255, BE243599, N89778, BE695242, AI420513, AV710714, BF311141, AW672892, BE244250, BE410858, BE390798, BE265269, BE018715, BE730637, BE392884, BE407259, BE408722, BE409678, BE796728, BE797085, BE279939, BG252804, AI990442, BE798385, BE877836, BG028222, W17255, H51332, AA101042, BE791799, BE259147, AA210904, AU129585, AA069873, H20075, BF025701, BE736857, BE890068, AA507302, H00417, BE799942, H19749, BE880605, BF676698, H46372, AI878952, AV709698, AI937600, BG026073, BE170116, AV749909, BE181361, W23659, BE181405, AA640620, T65652, AV727226, AA100199, H52769, AA046819, AA161408, AI743197, AI760050, BF663082, AL109658.5, AB049861.1, BC002801.1, AF283774.2, AK001511.1, AF112211.1, AK023585.1.
HTOHT18	552	628300	1 - 1485	15 - 1499	AC004928.2.
HTOIZ02	553	826312	1 - 535	15 - 549	AC023146, AC023146.
HTOJA73	554	797108	1 - 1280	15 - 1294	AI963720, AI284640, BF668217, AV728425, AL040409, AI334443, AF330238, AV725423, AV762395, AA610491, AV760777, AV761106, AW265385, AV762098, AI270117, BF241967, AV761362, AV710066, AW979060, AW500125, AF074677, AI431303, AL138265, AV763670, AV762064, BF725504, AI305766, AV729881, AW303196, BF697673, BF337291, AV757607, AW193265, BG249643, AV740801, AW301350, AV761843, AV762505, AV763449, AV761489,

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					<p>U18399.1, AL035423.4, AC004139.1, AF243527.1, AP000567.2, AC016025.12, AL162831.5, X55931.1, AL132780.5, AL158830.17, AP001224.3, Z94721.1, AC040160.4, AC005531.1, AL109919.18, AC004057.1, AC020559.4, AL117348.25, AL391415.12, AC034198.6, AL135927.14, AC007227.3, AC008687.4, AF126531.1, AL138724.12, AL356244.12, AC005081.3, AC007365.3, AL031680.20, AL021026.1, AC010792.4, AP000087.1, AL031670.6, AC023423.5, AL354674.5, AC004948.2, X75335.1, AC016691.10, AC073542.4, AC006367.3, AC011005.7, AL513007.5, AL136171.17, AL109804.41, AF223391.1, X54179.1, AL035681.13, AC007437.16, AC005933.1, D87008.1, AL133396.2, AL353807.18, AC012476.8, AC022384.4, AC011455.6, AC079383.17, AC006130.1, AC015853.8, AC006262.1, AL121655.1, AL109759.4, AC008764.7, AC004854.2, AL049776.3, AC005004.3, X55922.1, AP001708.1, AC007005.3, AC010103.10, AL590611.7, AL590762.1, AC010616.5, AL023494.12, AC007216.2, AF049895.1, U67801.1, AC010428.6, D88268.1, AF015153.1, AC004485.1, X54177.1, AP001694.1, AC005701.1, AL122015.17, AC004797.1, Z97181.1, AF045448.1, AL162713.19, AB041731.1, AC084882.2, AL049709.18, AC008616.6, AC016080.5, AL121949.13, AL138836.15, AC004041.1, AC012377.5, AC006254.10, AL135940.11, AL138784.30, AC009086.5, AC003109.1, AC005052.2, AC005998.3, AP001724.1, AL359435.7, AF064864.1, AF077058.1, AL096862.18, AL450339.5, AC006543.7, AL121899.37, AC012150.16, AL121972.17, AC002067.1, AL353739.4, AL355074.5, AC022383.3, AC023425.20, AL354676.10, AP001342.1, AC009311.3, AC020604.9, AL021978.1, Z94044.1, AL160175.5, AC008817.7, AF285443.2, AC023512.28, AC005037.2, AL109865.36, AL159140.4, AF252830.3, AF002992.1, AC024561.4, AL354798.13, AL035072.16, AL023799.5, Z81308.2, AC009039.6, AL139110.17, Z98745.1, AC007066.4, Z22650.1, Z69719.1, AC074000.8, AC072052.6, AC005908.1, AL135844.9, AC007256.5, AC027612.6, U95742.1, AL157938.22, AP002456.3, AC012351.3, AC007656.2, AL049757.14, AC006039.2, AC006207.5, AC005704.1, AP003438.2, AL135744.4.</p>
HTOJK60	555	545067	1 - 890	15 - 904	<p>AL079734, AL613389, AA129746, AL267356, AW970571, BE048991, AL267450, BF902572, AL133083, AL085242, H07953, AL253376, BG029528, AL038606, BF876179, AL207728, BF868894, AL049709, AA832016, BG222875, AA720774, AW089016, AW995665, BE084668, AA565911, BF821897, BG015615, BF529925, BE256101, AL357823, N30203, AL249447, AL537800, AA632839, AL440117, T74524, BE244243, AA501867, BE000614, BE154781, AA502207, AA084609, AA599080, AL679759, AV760019, AA191659, AA515351, BF078165, AW069412, AL284092, AW265359, AL056177, BE387304, AV757069, BF131490, BE049021, AW970987, AW276678, AW303098, AA584756, AW021627, AL628859, BE893315, AL251034, AA912287, BE501593, BE139139, AU117926, AC084864.2, AC078846.2, AC004815.2, U51560.1, AJ400877.1, AL445490.6, AC024082.6, AC007078.3, Z80896.2, AC012170.6, AL009612.5, AC005940.3,</p>

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HTPBW79	556	1317835	1 - 1360	15 - 1374	<p>AP000103.1, AF196971.1, AP001728.1, AC010654.8, AC006138.1, AC005378.2, AL389889.1.</p> <p>AL532387, AL532388, AL520598, AL534919, AL536351, AL529149, BE740155, BG031799, BE269797, BF984158, AL529148, AL537418, BF315754, BE891262, BE298901, BE409619, BE261844, BE296298, BF691759, BF316798, BE387294, BF316385, BE385498, BE279596, BG116442, BG115631, BF725854, BG236132, A1924354, BF058328, BE315264, BE279832, AW960909, AW953297, A1921207, BG027736, BE391898, BF981073, AW089642, AW607100, AW083566, AA779231, BF950834, BF769481, AL536350, A1597662, W72124, AA757487, A1004378, AA747708, BF950841, AA779154, AW966051, A1815918, AA181149, BF214063, AW609985, A1719697, AA181148, N52277, BE266550, BF514424, AA644552, AA315773, AV655765, AA657491, BE279156, BF997441, C05777, AA630867, AV647073, AA446396, BF512274, BF985404, BF894339, BE207304, AA768108, A1003424, N53936, A1358817, AA302986, BF986382, AA575917, AW615772, AV747904, AW409761, BE870050, A1815721, AV710773, AA009415, A1362635, BE276831, BF750334, AA554868, AA088502, BF802327, A1648676, A1560267, Z40243, N32193, R37325, AW628445, A1831717, BF871083, BF813931, BG004621, AA563856, AA868751, AA088448, T69236, R12437, N59026, Z44284, T58935, W77848, AA009696, R13448, AW241297, R37361, A1184854, T58875, BF872966, AA765983, A1383674, AA303060, N72929, AA296970, AV746892, R72050, BE934313, W38735, BF769484, AA027796, AA552128, A1423329, BE706063, BE074034, BE673575, AA323238, AA385759, AW610075, AA9535206, AA365395, AA973951, A1474457, BE934455, AA350856, AA843692, BE926535, BG003907, AA302913, BF593049, T54203, BG003213, AW827234, A1961882, BF590312, BF531118, BG025715, BF341680, AA507090, AA873450, A1742493, BC000001.1, AF212229.1, AK027711.1.</p> <p>AA779073, A1860913, A1028060, A1024955, BE549714, AW136463, R07163, AW612172, BF773051, AF007146.1, AF381980.1.</p> <p>AA059411, BE568135, BE856883, BF435859, BF977217, AV701624, BE566398, BE856637, AA429722, BE564953, BE568948, BF214557, AA196423, AW237471, AA716665, A1377511, AA193289, N51319, BF248318, A1796263, A1770155, AA045194, BE380112, BF029088, A1185077, AA442760, BF214729, BE865742, AA810811, A1572127, A1494075, BE777718, AA128609, AA933879, BF027898, BF691014, BF977570, AV702879, AA421072, N63065, BE866018, A1373224, R99289, BG003427, BE568709, AA919169, A1580336, AW024454, BF057794, AA731146, AA128610, BF105164, AA062583, BF031391, BE866602, BF238619, A1758175, AA045378, D61992, BF211153, R99375, AA420992, AA194235, AA976350, AW135598, A1648675, BF436083, BE392607, AA383499, BF368270, AA878813, AA877180, BE379677, A1219249, AA846496, AV760348, AA380012, BE866426, AA453722, BF687711, BF213063, H84990, H86604, H86921, A1519369, AA383353, BE742087, AA007586, T85467, BE514581, BF573588, BF028113, AL521923, BF091941, BE548812, A1244008, H55168,</p>
HTSEW17	557	460579	1 - 638	15 - 652	
HTTB176	558	637725	1 - 1697	15 - 1711	

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HTTDB46 HTWCT03	559	812763	1 - 3045	15 - 3059	AA379174, BE621508, AI200967, BF346162, AL137861.5, AC005690.8, AF277188.1, BF333492, AK025267.1, AK025111.1, AB020625.1, AC016572.5, AC022413.4, AA429504, BE709846, N57518, AA279467, H09648, R41904, AA007236, BF764791, AW810272, AU119787, BE790560, BF589035, BF437720, AW135490, U74490.1, Z95704.1, AL078621.19, AP001761.1, AP000218.1, AP000340.1, AC004908.1, AC002055.2, AF270552.1, AB019437.1, Z96386.1, AK021903.1, AF017466.1, AF328497.1, AF035187.1, AF035188.1, AF327134.1, AF229518.1, AF328523.1.
	560	429618	1 - 1949	15 - 1963	AL528049, AL043219, AW088366, AW152013, BE779803, BE672597, AW243555, AL18186, AI653697, BE251084, AU160597, AU150608, AI871013, AA496891, AA428540, AA349190, AW249598, AU101503, AU151739, BE502287, T18883, AI202674, AU152190, AW732070, AI376266, AW139928, AI299710, AI888510, AI658535, AW341396, BF976767, BF224111, AA912087, AA694485, AI887614, H17658, AA432221, T33286, AI571236, AI299136, R56443, R51367, BF447467, AI367595, AI420610, AI825055, T70333, AA28620, AI681192, AI499499, AI197972, AA664995, BE045622, AI961711, AI184815, AA888827, AA768736, AI659770, AA292170, AI383839, AI888009, R51842, AA973896, AW470342, AI915171, AI989713, BF802487, BE799943, AI275745, AI934660, Z39039, AA634437, AW137356, F04023, AI762348, AI253211, AI824874, AL136295.3, BC004159.1, AK001435.1, AF006264.1.
HTWDF76	561	714344	1 - 949	15 - 963	BG110010, BF348119, AV752258, AW960913, AW837029, AA830796, AW341012, AI357797, BE245295, BG024559, AA416565, BE219747, BE244253, AL041811, AW873066, AL042799, AI566919, AI360837, AL043293, AW204206, BE244954, AW136438, AA293271, AA293147, AA768819, AA421196, AI866607, N54734, BE246603, AW103651, AA504427, AA742631, R48713, AW516216, AA477218, AW449257, BE242807, BE246950, BE244342, N45286, BE243865, BE244618, AI935341, AW241506, AI796656, AI827114, AW594392, AA490904, AA282990, AA341448, BE243927, AA047868, AI671389, AA491090, BE241902, BE890911, BE242908, BE244837, BE244033, BE241703, AW241451, AW750796, R48610, AW391094, AA283160, AA814015, AW959980, AV703923, AV703927, AV709932, AW951882, AV658751, AV701728, AW949383, AW962978, AW959870, AV706417, AW955596, AV706165, AV707079, AW953938, AW964267, AW954237, AW963619, AW949451, AW954211, AW954006, AV705684, AV708320, AW964036, AW964061, AW964409, AV650283, AV650591, AV650691, AV650768, AW956626, AV702789, AV725031, AW960201, AV707503, AV686405, AV701800, AV705437, AW957428, AW963478, AW950210, AV702745, AW964410, AW950258, AW954134, AV709273, AV726934, AW950018, AV709549, AV705024, AV727272, AV959796, AW957062, AW951536, AW952196, AV728715, AV707087, AV704133, AV725633, AV725393, AW953953, AW949478, AW966604, AW959804, AW960629, AV706975, AW959868, AW953786, AW963405, AW951304, AV706013, AV728244, AV727381, AV704577, AV705247, AW950012, AV725153, AW950443, AW964422, AW960538, AW953807, AV704771, AV704756, AW959346, AW949472, AW960601, AW952168, AW952403, AV657617, AW952183, AV729076, AV703819, AV727015, AV706827.
HTWJK32	562	699794	1 - 897	15 - 911	

HTXCV12	564	1352213	1 - 1120	15 - 1134	AV706342, AW952751, AV725709, AW956075, AV645936, AV709587, AW955723, AV658084, AV692600, AV650315, AW963768, AW956762, AV697880, AV659389, AV727613, AV656373, AV726010, T18597, AV660258, AV647789, AW959521, AV708109, AW956474, AV727787, AV659294, AV703146, AW960655, AV725745, AV680600, AW951239, AV660608, AV728148, AV726590, AV656478, AV703790, AV709314, AV653333, AW952418, AV654070, AV658863, AV691080, AW951281, AV702385, AW949802, AV658275, AV652001, AW955662, AV707979, AV703669, AW954011, AV709580, AV727003, AV725208, AV707155, AV725582, AV708786, AW957517, AV659547, AV702372, AV727526, AV651920, AV725618, AW954439, AV727510, AV704897, AV702266, AV728523, AV725577, AV704551, AV725033, AV706223, AV728924, AV725617, AW954206, AV707863, AV725991, AV696931, AW952410, AV703062, AV727822, AV699089, AV705135, AV701874, AV703501, AW962444, AW964585, AV702772, AV704774, AW964440, BC001978.1, AL117512.1, AB032966.1, Z30183.1, U94592.1, U45328.1, AF217994.1, Y08991.1.
	563	634083	1 - 393	15 - 407	BF664013, BF663121, BF663613, BF513422, AW450480, AW772007, A1741780, AA836248, AA927283, A1076561, AA832167, BE328468, A1122857, AA843388, A1051024, AA976372, A1128635, A1079659, A1377082, A1890194, BF433849, A1245546, BF431488, AA993068, W37347, AA664259, BF592129, A1078547, A1206154, BF476097, AA205973, A1628461, AA205959, AA564731, AW510675, A1333181, BE044542, A1220211, AA461495, A1205070, AW589962, A1659288, A1628811, A145738, A1038255, A146583, A1350952, N72913, AW172853, AA701323, AA879132, AA479117, AA928163, A1807914, AA053133, H96808, A1274742, AA446266, AW665166, AA983816, A1720197, BF593265, A1207274, F10245, R44951, W02663, AA773436, A1266048, BF438897, AA668420, AW593105, AA889759, H72321, A1051520, AA948635, AW973548, AA716356, AW418816, BE871115, A1677720, R07863, A1244578, AA206136, AA721247, AA626673, AA420708, R34711, R09438, AA653900, A1219624, T79760, A1269408, AA460570, BE743375, A1679772, W25733, A1927666, F30470, AA190369, AA420733, AA206135, AA206150, AK021823.1, AL021786.1.
	562	1352213	1 - 1120	15 - 1134	A1014551, A1379840, AA928131, AA463863, AA463357, A1360362, A1553741, A1933132, AA682260, AA437378, AW612124, BE939238, AC017099.11.
HTXDW56	565	695765	1 - 1569	15 - 1583	BE891580, BE874295, BE272309, BE905589, A123343, BE790068, BG171568, BF797209, BE746860, BG027340, BE866834, A1765620, BE394238, BF978180, AV691685, BF131943, AW993028, AA725071, BF701185, BF029881, BF724883, AW271710, BE855449, BG122640, AV692294, BE549980, A1916562, BE936367, BE936346, BF130329, BF244421, BF088035, A1634990, BF088014, BF088012, BF088026, BF449073, BG165351, BE936324, BF593983, A1654165, BF939873, A1991405, BF592056, BF088032, A151546, BE936318, BF923670, BF088037, BG250837, BF088024, AW750352, A1983985, AW299864, BF088028, BE936364, A1670830, BF088019, AW750348, A1570128, BF197216, AW168930, AW009948, AA704525, A1749744, BE349529, AW000916, AA861614, A1955276, A1492455, A1676055, BE549294,

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HTXFL30	566	620001	1 - 1977	15 - 1991	<p>             BE891940, BF851322, W28069, AW298651, AA112484, T08083, BF955273, BE275577, BF342801, AL529204, AI660428, AW003481, AI469418, BG231875, AU160542, AW003722, BE221902, AL530582, AI697903, BE741000, AU144726, AA433918, AI371156, AA029908, BF516011, AI017052, AI150233, AA846607, AI095354, AU118071, AL042959, AI653247, AI338204, AA552385, AL528110, AI001078, AI168113, W31264, AL529205, AW449063, BF510837, AI061060, AI251838, AW770273, AA810494, AW383853, AL582444, AW440361, AI337406, F25991, AA040569, AA030037, BG258196, R52694, R60246, R61272, AI225083, BE562335, AI474379, AA813625, BE503451, AW957171, T33316, F08876, AI394687, BF979612, AA706515, AI372806, BE407233, AA938133, AI962262, AA694463, AA806149, BG256771, AA371703, AL523910, BE384815, BF087775, H56115, AI265837, BG151348, BF930219, H05238, BE397686, AW840116, H18625, AW166747, AW839962, AI832256, BF793735, R46092, F09405, AI570516, AI832533, AI264936, AI201947, AI916913, AA076196, AI206207, BF813476, F08877, AI468489, AI949645, AI273819, AA732023, AA743249, AI918304, AA425605, BE047789, BF084883, BF374860, BG119332, N91827, Z40907, BE560246, AW008923, AI085806, BF003088, T65375, BF765564, BG230772, AA214506, BF843766, BE907797,           </p>
HTXKP61	567	824083	1 - 1195	15 - 1209	

HUDBZ89	568	1352211	1 - 2121	15 - 2135	<p>AA86844, BF914189, AI372805, AA034314, T47081, BF685922, AW383854, AI493557, AA670130, AL036905, BF724094, BF882198, AW750565, AW816798, AW175913, BE727732, AA215302, AA436121, AA040668, AI424583, AA434601, R88938, BC002855.1, BC008053.1, AL136657.1, AL137200.1, AK021605.1, AB037846.1, AF265228.1, AL035417.15, AC005043. 2.</p> <p>AIU25474, BE883532, BG107414, BE898459, BE746984, BE542496, BF575571, AW958579, BF314540, BF573504, BE734208, AI802426, AW953779, AW292502, AU149129, BG031927, AA436628, AA076658, AU150986, BF081743, AA046746, BF095716, AA046670, BE186054, AW601449, AW673051, AW294732, AW601455, AI910194, BE092409, AI601235, H66950, H66951, R85537, AA363520, AI202299, R40736, AA363830, BF085875, AV749014, BE876022, AW190087, AL520949, AA808657, T98596, AW896216, T98595, AA355808, AW377204, AW377198, AA079565, AW377106, BE699057, AW377170, AW752839, AW362224, AI232345, BE832662, AW579894, AW579890, AI362898, AW377180, AB007866.2, AL109823. 23.</p> <p>AW389141, AW609901, BF374842, BF374845, AW388854, AW389152, BF374846, AW389148, AW389140, AW388908, BF374844, AW752215, AI797737, AW662557, AW375776, AW389144, AI990471, AA625286, AW388954, AW271542, AW752222, BF032067, AI953121, BE504740, AW389077, AW388858, AA303053, AI991077, AA303052, AW388926, AA613119, AA297581, AI963985, AW388918, AW388731, AW388732, AW388759, AA524545, BF513041, AW811008, AL132639. 4.</p>
HUFBY15	569	1352349	1 - 1179	15 - 1193	<p>BF929940, AU137259, BE065411, AU128307, AW818223, BE154234, BE065240, BE065404, AW856804, BE065281, BE065188, BF755156, AW939313, AW876637, BE065282, AW936927, BE065231, BE866484, BE065242, AU121120, AW992038, BF577152, BE612443, BE065370, AV731147, BE161681, BE065317, AV732111, BF679479, BE065413, AW969925, AV730460, AW857254, BE065118, BF104734, BF759242, BE082759, AV709805, BF755153, AV730235, BF037518, AA977057, BF836355, AW876639, BF948215, AW996889, BF755154, AW935656, AW973139, AA528530, BF734987, AA191204, AL046030, AW855823, AU135945, AW501852, BF969464, AW863794, AW890245, BE139153, BE085108, AL119323, BE065280, AA601495, BE011046, AA493718, AL046784, BE011043, AI624655, BE011042, AW896115, AA761416, BE972565, AL120423, AW302839, BG010346, BF959938, R84363, BF960892, AA682353, AL042414, BF962824, AL041416, BF831226, T06958, AW993651, BF854999, BF956969, BF736812, BF962008, BF753245, BF772428, BF673759, BF916693, AW993753, BF883025, BF923362, AV730003, AI026925, BE157145, AV704579, T71060, R79525, BF893577, AA325164, BE064368, BE157315, AA205322, AA346163, AA457283, BF809496, BE011045, AA533484, AU137226, BF210705, BF895153, AL120163, AV732374, AW812457, BF751447, AI557245, AA554985, AV655163, AA321733, AV732067, BE206708, AV729982, BE044670, BF679337, AA113115, T06803, AA491346, AA219222, AW391396, BE011047, BF687597, BF964256, AA180025, AA577884, AW866346, BF930824, BE165031, AV731981, BE257366, AI298238,</p>
HUFEF62	570	645101	1 - 504	15 - 518	

1318

					AC078814.22, AL109845.8, AC006374.2, AC004885.2, AC025442.5, AC010528.8, AC005799.1, AF036235.1, AC025040.7, AC010368.4, AC005532.1, AL117351.12, AL080275.20, AC023480.6, AP002088.2, AC009318.11, AC076972.16, AC010145.9, AL13334.16, AC006337.5, AL163541.13, AL353691.12, AL160267.17, AL078638.9, AC007001.2, AL109761.3, AC009046.4, AC010651.7, AC003064.2, AC026161.4, AC003687.1, AF196972.1, AC006131.1, AL158093.8, AL162500.15, AL162719.18, AL355530.6, AC002416.1, AL034399.6, AC022367.34, AL031985.10, AC008243.6, AL158153.10, AL357045.10, AL079305.3, AC016651.6, AL162579.16, AC018503.6, AC004748.1, AL121927.24, AP000314.1, AC008716.6, AL109621.5, AL158147.17, AC007444.1, AL161916.8, AL008713.1, AL137017.9, AL390802.2, AL391420.16, AC005604.1, AC006061.1.
HUKAH51	571	1352424	1 - 839	15 - 853	AA502331, AA503839, AW592433, AW444616, AW957011, AA568450, A1017393, T85589, T72043, T78178, AW079940, T85588, A1699382, AA299977, BF593574, T86494, AW605240, AW956056, AA335186, AA551860.
HUKBT29	572	694590	1 - 1743	15 - 1757	AI889172, AI080136, AA211445, AA211523, F24617, AA211502, F27978, AW614056, AI862904, BG222837, F28119, F30666, F29048, AI972919, AA211549, AI128717, Z24989, AW302460, F28086, F26294, Z28706, AA413432, R45814, BG014944.
HUSAT94	573	606599	1 - 2220	15 - 2234	AU146312, AF202343, AI752834, N22016, BF989159, AW970571, AW275432, AA714011, AI674840, BF869052, T57767, AL047879, AI627917, H68343, AI281561, BG222875, AA664126, T50676, AA904275, AW243793, AA297006, AA650384, AI633386, R93919, N33184, AA584756, AA487475, AI933716, AA501867, AA642809, AI356443, AI439393, AI160786, AW973992, AW833865, AA534064, F35684, AI798407, AW779609, AW961582, AI962094, AW875140, AC026464.6, AB023048.1, AL356299.16, AC004196.1, AL512430.14, AC007057.3, AC004890.2, AL049758.11, AL096702.10, AL136971.7, AC013726.7, S42653.1, AF053356.1, AC004873.3, AC021016.4, AL023807.6, AI400626.1, M87914.1, AC005736.1, AL022313.1, AC018758.2, AL031597.7, AP003478.1, AF165926.2, AL117351.12, AL133353.6, AC073073.2, AP000510.2, AC005971.5, AI277546.2, AL391602.6, AC020913.6, AC002425.1, AC012309.7, AC009060.7, AL359813.23, AC006483.3, AL022316.2, AC004622.1, AC002310.1, AL137073.13, AL390060.14, AL133246.2, AP001063.1, AC004166.12, AC007193.1, AC002565.1, AC002477.1, AL132821.17, AB000877.1, AL161747.5, AL512641.9, AC007066.4, AC006013.3, AC002404.1, AL109797.18, AC008465.2, AC004858.2, AL139339.22, Z99716.4, AC009756.9, AF109907.1, AC008649.6, AC010618.7, AL133545.10, AC022384.4, AP001435.2, AL138849.12, AC008015.5, AC067722.21, AL121808.4, AC008733.7, AP001712.1, AC011449.6, AC004883.2, Z95113.2, AL160471.5, AC011495.6, AL138720.19, Z95114.19, AC008507.8, AC016526.6, AP000704.2, AC004491.1, US5885.1, AL353594.13, AL158158.14, AC006344.2, AL031311.1, AC004910.1, AC008764.7, AC004167.1,

					AC005821.1, U91326.1, AL049872.3, AC005914.1, AL138752.5, AC005183.2, AF000501.1, AC007679.4, AL158132.1, AC020906.6, AP001053.1, AC005098.2, AL049569.13, AC083884.6, AC007676.19, AP000506.1, AC009194.8, AC008481.7, AL359236.4, AC011442.5, AL163201.2, AL357515.26, AL035530.11, AL008712.1, AC009120.8, AP001752.1, AC011443.6, AC012507.9, AL034420.16, AP001717.1, AL133516.8, U96629.1, AP000047.1, AL022163.1, AC005808.1, AC011489.6, AC002544.1, AL163279.2, AC008753.8, AC009073.8, AC004757.1, AC018828.3, AC005255.1, AC010654.8, AL355312.24, AL139330.17, AL031584.1, AC006023.2, AL121578.1, Z83826.12, AL033529.25, AL121933.15, AC020916.7, AC007226.3, AL121920.21, AC010605.4, AC022383.3, AL121981.17, AP000305.1, AL162231.20, Z98946.15, AC011485.6, AL445435.11, AC022432.4, AC020934.7, AL355480.22, AL353682.11, AC005740.1, AC011452.6, AF334404.1, AL137060.13, AP000008.1, AL020997.1, AP000892.4, AC022211.5, AL034379.8, AP001753.1, AC006046.1, AC011450.4, AC011475.6, AF111167.2, AC005756.1, AC083855.2, AC011445.6, AL139385.12, AC005081.3, AL049795.20, AL133294.10, AC000025.2, AC018720.5, AC073838.6, AB000882.1, AL359091.10, AC008946.6, AP001670.1, AC011491.5, AC007005.3, AC005480.3, Z93241.11, AP001711.1, AC005527.3, AP000997.1, AC010422.7, AF121781.1, AC005391.1, AL031727.42, AP000115.1, AL035697.19, AL050307.13, AC026168.3, AL132639.4, Z97630.11, AC016995.4, AC007546.5, AC007284.4, AL132640.4, AC006946.20, AC008755.6, AL451075.15, AC018755.3, AL139099.2, AC005207.1, AC007687.16, AC019205.4, AC005519.3, AL160175.5, AL158192.15, AL021917.3, AL035447.6, AL391839.9, AC004383.1, AP001727.1, AL080243.21, AC019227.4, AL354720.14, Z98256.1, AL353692.14, AL049843.18, AL096703.14, AC008651.7, AC005702.1, AC020904.6, AL136087.12, AL136126.34, AC002994.2, Z84476.6, AC005261.1, AP001716.1, AL139021.6, AC005409.1, U91323.1.
HUSBA88	574	895435	1 - 2719	15 - 2733	AL523767, AL523766, AL534781, AL534780, AL520340, AA631254, BF980870, BF025808, BG117187, BE903546, AL525480, AL134946, BE547682, BF689660, BF690050, BG112657, BG117835, BE549463, BE267342, BE272776, BE389207, BE391009, BF691214, AL044321, BE313738, AW973289, BE546942, BF526451, BE731944, BG222445, BG059600, AL491910, AW007614, BF814155, BF369685, AI953501, BE464642, BF805455, AI917090, AI978995, BE244697, AA973854, AA633180, BE302322, BE207390, AW135158, BF819128, BF750464, AA554487, AI085269, AW590093, AA552299, BF840610, AI074043, AI368739, AI625167, AI392734, AA152129, AI092500, AI284956, AI674849, AA622700, AI911031, AI222882, AW166519, AI422345, AW138933, AL535407, AI310415, AI184201, BF197681, AI312031, AA918128, BF509177, T16005, AA150046, BF476531, BF447081, AA446899, AI347403, BF369787, BE220358, AI025115, AA814202, AA954034, AA024530, BE048253, AA622916, AI652343, T03436, R16652, R55729, BE409571, AA579670, AA860282, BF844073, AI659372,

					BF883470, AA938700, AI613099, BE243770, AW276129, BF884695, AA716593, AI620627, AW469792, AI866467, H46222, BE930981, AI302925, AA603464, AI280488, AI745062, BF879687, AI608918, W60259, BF915326, BE005089, AI381005, AA447019, AI365502, AW087294, AI805689, AA635696, BE709955, BF750511, BF689976, AA074529, T20224, R55744, T12605, N55763, BF054944, BG006244, AA994847, AA948154, C01917, T20223, W60369, AI811801, AA834449, AI979298, AA508844, AA87802, AA948154, C01917, T20223, W60369, AI811801, AA889186, AA828890, BC006079.1, BC002953.1, AF145732.1, AF148509.1, AL110221.1, AU132783, AU135545, BE879986, BE875866, BE875592, AU138137, AI343496, BE889561, BE179171, BF437308, AI627188, AW514639, AU128177, AU128176, AI287966, AA862577, AU123709, AI674555, AU138293, AA917000, AI811236, W52793, BF790472, AV746689, R52090, AW241400, AA948155, AW964602, AI762045, AI971433, Z40332, R49159, AU136203, R81617, BG024648, BE843297, AA969855, BE816922, BE769518, BE816921, BE816943, BE816951, AU138770, T30870, BF329070, BE835821, BF671946, AU138360, AU135153, BE179399, BF982177, BE769579, BE816923, Z44401, Z24991, AW379766, R81358, BE819508, AW946464, AA383566, AW956753, AW946480, D86326.1, AK002093.1.
HUSIG64	575	566762	1 - 996	15 - 1010	BF683736, BE730782, BF792931, BF446001, BF205853, BE734189, BE796114, BG252706, BE560701, BE560444, BE562462, BE869307, BF309461, BE397034, BE560928, BE560121, BF691174, BF204949, BF312317, BE387292, BE856236, BG122978, BE298856, BE792425, BF797657, BE869619, BE616370, BE616612, BF306220, BF306195, AV655974, AW978168, BF305460, BG120823, BE560047, AW978171, BE882111, BF037530, BE676498, BE251660, BE270241, BF203303, BE902628, BF309616, BE267578, BG033765, AA485950, BE065146, BG254407, BF310813, BE312978, BF306475, BE905968, BF446006, BE737387, AW984420, N22768, AI176598, AW984416, BF125825, AW984417, BF307029, H95262, AW984415, BF435055, BF979227, BE693917, BE732765, AW984418, AW984423, BF306361, AV753202, AV690488, AI176958, AW984338, AI751645, AI301138, AA315010, AI830086, AW984422, AA176601, BG057361, BE390359, BE314347, BF307951, BG120049, T66123, BF030495, BE348975, BE675980, BE905732, BE538385, R61430, AA176961, AW337133, AW189210, AI764229, BF727126, BF573743, BF979483, AA779980, AW984421, AI142549, BF305130, BE931839, BE297623, BF941393, AA451629, BE044637, AW984413, BF308011, AW192745, AW027544, W37275, AA827128, BG115366, AI151013, AA034495, AA604131, AV650977, AI127612, AW150320, AI524711, AW973257, AI861987, AI469431, AW090258, AI985865, AI129520, AI129524, H37844, AA063465, AA151284, AW513431, H99312, AW984346, AI312744, BF819503, AA781668, AA026636, AI093350, AI089601, N25147, BG235957, AA191371, H72514, AA115146, BE298404, AA309734, AV749302, AA127064, AA709104, AA779590, BE901613, AW075416, W94571, BF375767, AA429862, H96717, AI458596, AI751646, AA828465, W65488, AI144280, N70034, AA630583, BF379967, W94665, AI990143, AW074204, N54139, AI360050, AI139072, AI298031, N31021, BE246664, AA151285, AA113370, AI673233, AA279340, N55099.
HUSXS50	576	1352367	1 - 2547	15 - 2561	



						AA341830, AW984344, AA620847, BF928260, AI289617, AW074213, AW364601, N58667, AA777063, AA489561, AW887094, N95463, R81022, BG055405, AA766203, AI038290, AA025249, T58352, AW189287, AW028461, AI633400, AW984345, AI177792, AI299766, BF799616, H75310, AI200071, BE561076, BG249896, AI499250, AA354776, W65499, AA809914, AI903841, AI453808, T71499, H10629, H58855, AI094411, R87151, AW089182, W96032, H81218, H81223, AV726304, R95799, AI370222, AA548305, R66175, AA814999, W80425, H94290, AA216453, BF798979, AA927662, H81224, W25203, H66405, BF092277, W02774, N48499, BE278547, N40461, AA846361, H19408, AA602474, AV738327, R89366, BF448937, BC008361.1, AL050254.1, AF233225.1, AF129537.1, Z71183.2, AL021937.1, AL035068.3, BG058664, AW953071, BF668217, AL046409, AI284640, AW406162, BF852604, AU123691, AL046205, AW303196, D82290, AW301350, AI334443, AV761286, AL121235, AW274349, AW600804, BF339640, BF677892, AV763892, BG032943, AI572924, AI801482, AI431303, AL044940, AV740801, AV764490, BG249643, AV762098, AI270117, AW969629, AI732378, AW265385, AI963720, AI708009, AI350211, AI471104, AW473163, AA669840, AV735495, AI149478, AV763971, AA581903, AV759518, AV760937, AI754955, AL041690, AI583283, AV710066, AV763550, BG236735, AU145314, AW502975, AV742057, BG167743, BF940837, AW193265, AV760777, BF914859, BF918590, AF074667, AV763122, BF918640, BE908796, BG036337, AW513362, AA491814, AV759362, BF725315, AV762050, AV763354, AW021583, BF919090, AI203955, AA531580, AA613232, AA490183, D82542, AW576391, AI623720, AV739452, AV728425, BE350475, AW500125, AA521323, AA665330, AV702857, AV730391, BF347791, AA610491, T40452, AA584167, AW474160, AI613280, AV762139, BE253048, AI192631, AI732865, AW020992, AA938105, AV773383, AF074677, AV652936, AW276817, BE872393, AW088846, AW438643, AI434695, AI345654, AW270270, AI610159, AW274346, AW265170, BF680041, BF854876, AA469451, AI589230, AA584145, AW833862, BE047069, AI570261, BF347740, AI619997, AW264934, AL042420, BF475381, AW518220, BF942454, AV762009, AI708125, BF697673, AW148792, BE297262, BE731867, AV759505, AA457542, BF991286, BF806176, AV728410, AU159337, AW089322, BE164494, AA74222, AI345518, AW963497, AV763255, AI696962, AL041706, F36273, AA496508, AV764228, AA478355, AV713243, AV761613, BE677379, BF736198, BF916517, AW079135, AV735370, R99597, AA652764, AW029038, AV725423, AA410828, AW169517, BG250302, AV761786, BE393367, BF872630, AF063563, AV764241, AA601294, BF827410, BF812839, AI119691, AV760378, AA177061, BG177715, BF674620, AI298710, AW169151, AA502104, AI345681, AI345675, AA633798, AV761925, AA682912, BF965007, AV733710, BF680074, AV762768, AA579362, BE139146, BF217299, AV762111, AV764578, AL118559.6, AB038653.1, AC020904.6, AC009497.3, AC006581.16, AF001549.1, AC004638.1, AC008267.6, AL121601.13, AL109865.36, AL356915.19, AC018809.4, AL163973.1, AC023908.6, AC011465.4, AL160237.4, AP000459.3, AC005081.3, AC044797.5, AC009154.5, AP001760.1,
HWAAD6 3	577	838626	1 - 3294	15 - 3308		

AL035367.5, AC007298.17, AL139350.17, AC006329.5, AC004019.20, AC006038.2, AC011455.6, AC008616.6, AL354932.26, AC011461.4, AL161892.9, AC005911.6, AC008265.15, U80017.1, AP003357.2, U91323.1, AC018636.4, AC005562.1, AL096701.14, AL080243.21, AC011450.4, AL133367.4, AL162458.10, AL354720.14, AC020658.6, AL158830.17, AL050318.13, AC005839.1, AP001687.1, AC009144.5, AC005041.2, Z99495.1, AC002565.1, AC022007.3, AC018769.2, AP000031.1, AC008372.6, AC011811.42, AC008688.7, AC009298.3, AP000047.1, AL445222.9, AL163248.2, AL139113.21, AC006435.7, AL136219.17, AC011495.6, AC008562.4, AC022308.17, AC008537.5, AP001667.1, AL133399.1, AL353135.32, AL121809.6, AC005522.2, AC0073838.6, AC002476.1, AC006028.3, AP000115.1, AL445928.8, Z69666.1, AC005553.1, AC084783.2, AL133485.3, AC016025.12, AC004906.3, AC008649.6, AP000553.1, AC009470.4, AL031054.1, AC007193.1, AP000338.2, AL117334.29, AC009530.5, AP001346.1, AL034380.26, AC016830.5, AC008403.6, AL049550.5, AC027644.9, AC011930.5, AL109965.34, AC006241.1, AL049869.6, Z83844.5, Z98941.1, AL031283.26, AL159191.4, AP000216.1, AC009996.7, AC015842.9, AL136295.3, AL139330.17, AC008745.6, AC005527.3, AC007731.14, U47924.1, AC012377.5, AC025212.5, AC005500.2, AC018751.30, Z93241.11, AL078638.9, AL354993.24, AC016769.10, AC005324.1, AL355517.12, AC074121.16, AC012170.6, AC006538.1, AP000962.2, AC004650.1, AC083884.6, AL354935.23, U52111.2, AC016027.15, AC079363.19, AP000113.1, AP000045.1, AL136123.19, AC007011.1, AL357150.7, AC008753.8, AL121675.36, AC002551.1, AL157838.24, AC009516.19, AC004865.1, AL139230.25, AC005529.7, AL050335.32, AC007216.2, AL049759.10, AP001716.1, AL021546.1, AC000360.35, AP001718.1, AE006639.1, AC025436.2, AL359091.10, AC004940.1, AC008101.15, AC003029.2, AL352978.6, AC020983.7, AL118520.26, AC007272.3, AC005154.1, AC078878.20, AL136980.5, AC005778.1, AC004971.3, AL033383.26, AC005921.3, AL159995.8, AC008068.4, AL008718.23, U95742.1, AC068712.6, AL024474.1, AC005031.1, AC017091.8, AC090514.1, AP001666.1, AL158040.13, AL161799.19, AL133387.8, AC003108.1, AC005808.1, AL109825.23, AC004033.3, Z98051.6, AC005295.1, AL353764.9, AC011236.8, AL132768.15, AC006285.11, Z99716.4, AL139396.17, AL096840.25, AL022098.1, AC005052.2, AC002300.1, AC007066.4, AL109797.18, AC004686.1, AL031662.26, AC008812.7, AL161656.20, AL136961.19, AC007404.4, AC020550.4, AJ003147.1, AP001858.4, AC021203.5, AC011559.3, AL117258.4, AC007620.30, AC010553.6, AP002028.1, AL356575.8, AP000299.1, AL121748.6, AL136300.22, AC016257.22, AC003684.1, AC004941.2, AL157406.19, AL049694.9, AL162853.17, U66059.1, AC026464.6, AL121972.17, AC013264.4, AL162426.20, AC006345.4, AC090960.1, AL049742.7, AC005037.2, AP000359.1, AC007051.3, AC018633.2, AL133174.15, AC008474.7, AC018635.6, AB023049.1,				
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HWABA81	578	580889	1 - 852	15 - 866	AC034198.6, AC022211. 5.
HWABY10	579	768334	1 - 2936	15 - 2950	BE676836, AL121897. 32. BG110964, BF795642, BF338736, BF344299, BF339610, BF344724, BE905985, BG171717, BF663359, BE878057, BF344117, BF797494, BE779728, BG110428, BE548198, BG113392, BE514891, BG105728, BF344895, BF342409, BE731592, BF344700, BF326253, BG107408, BF337274, AA029404, BE873119, BF339289, BE537561, BE546615, BF215522, BF348090, BF341943, BF974666, BG106809, AW517110, BE866817, BF337936, BE312135, BF342571, BF339613, BF795397, BE259965, BG025377, AW328067, AW051360, BF112053, AW467352, AW328066, BF305147, BF432273, BF925893, AW517104, A1921698, A1683501, BF338943, BE910326, AW732485, BF338023, BE465948, W38916, AA779337, BF854480, BE045837, W25986, AA973853, AA101157, AW084136, AA181835, AA775283, AA186569, W68073, A1560223, A1147239, A1089340, A1095449, BE670405, AA082143, A1066562, AA679092, A1422300, A1613463, AA588711, BG176783, A1761003, A1088731, AW051882, A1126290, BE646503, AA837279, AW087365, A1148227, AA009501, A1283584, A1434557, W28104, T62574, A1951073, AA782618, A1479881, W47512, N46795, A1985937, N40931, A1039397, A1432803, A1583386, BF802889, BF832903, BF804217, AW956881, W46793, BF802896, W68195, BG230721, BF815862, BG222416, BG222489, A1083847, BF806737, N40938, A1684916, AW576132, BF805055, W45117, W27429, AA324201, BF876216, AA862278, A1627377, Z43491, W26072, BF871297, W46921, AW518033, BG055999, AA071418, BF339697, BF432684, BF664265, H87824, BF804896, A1369040, N46788, A1280551, AW393985, BF343179, A1961956, R54302, AW393954, AA021161, W25922, AA574349, BF819220, BF933082, T08587, A1954952, T03895, AA910718, BF832997, BF833048, R60251, A1272774, A1682434, AW351625, A1369469, BF432394, W47511, AA366238, AA021160, AW394010, BF814966, BF089042, BF155712, AA379745, AA877680, BF834816, BF359736, BF155722, A1373184, BF833953, N79680, A1370695, A1633094, A1244521, AW367090, BF832989, A1564952, T60257, Z39561, BF832028, BF964430, AA071417, BF831958, A1475015, AA843970, BF834819, BF831774, BF832084, BF128611, BF838597, AW243364, BF832026, R51913, AW973898, BF834823, AA381066, BE868310, AA077947, BF832092, F34684, AA318041, F03657, T63198, BF834818, N62740, AW407707, A1905924, AA844604, AA594549, BF834825, AA036914, BF749722, A1962077, T03318, T30346, AW902956, BE874414, T61397, A1915039, A1097627, BF831259, BE829374, BF832901, BF941457, H87774, BF094249, AW243479, BE563198, AW003146, BF752515, AW589814, BE815641, AW518327, BE714416, AA782804, BF831773, BF155715, AA026160, AA628683, A1136610.1, AK000539.1, AC073347.3, AC073237.3, AL162008.1, AF126488.1, BC008784.1, AL359932.1, BC004905.1, AL157480.1, BC006480.1, BC008282.1, AK026541.1, BC004119.1, BC008488.1, AL122049.1, AF218031. 1. AW958273, AW377130, AW574767, AW138853, BF111962, AA135712, AA156931, AW264402, AW117200, A1684896, AW339989, AA524553, A1394626, A1754796, A1860485, A1989549,
HWADJ89	580	799506	1 - 1755	15 - 1769	

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HWBAO62	581	838164	1 - 1889	15 - 1903	<p>AI683471, AI792952.</p>
HWBAR14	582	1107118	1 - 3864	15 - 3878	<p>BE867241, BF972601, BG122427, AA631143, AF109299, AI703348, BE674096, AA579486, AW175665, BF854834, BF922235, AW135465, AI969820, BE673709, AA984323, BF446419, BF223843, BF222329, AA640153, BG255296, AI587483, AA225106, AA631024, BE835026, BF854825, AA112573, AI468280, AI696721, AI911903, N95796, AI525162, AA492342, AA579735, AA570251, BF510045, AI472447, BF371417, AA112574, W24907, AA552457, AA652651, AA652452, AA579320, AI984307, AA364356, AA579319, AI432644, AI623302, AI431307, AI431316, AI431238, AI432666, AW968355, AW968356, BF680993, AI431347, AI432657, AI432661, AI492519, AI431350, AW972093, AI432653, AI431231, AL042519, AI431230, AI431257, AI431328, AI432654, AI432655, AI431310, AI431312, BE672644, AW081103, AI432650, AI432677, AW971740, BE672745, AI431323, AI431318, AW968729, BE672759, AI791349, AI431354, AI431353, AI431235, AI431247, AI431321, AI431315, AL045494, AI431246, AI431308, AI432674, AI432643, AI432675, BE672748, AI431337, BE672640, AI432651, AI432647, BE672732, BE672719, AW129223, AI431243, BE672622,</p>

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HWBAR88	583	836469	1 - 1037	15 - 1051	AV704722, BF890753, BE832379, AA334103, BF513764, AI654920, AW418882, BE503701, AI949038, AI093540, AA703125, AI076049, AI356640, AI359681, AI160128, BE858525, AV717717, AL422536, AB020316.1, AL357992.14, AL590485.7, AL359252.17.
HWBCB89	584	1093347	1 - 1303	15 - 1317	BE383506, AW957082, BF965615, AA749209, BE314194, BE856755, AW959644, AA406605, BF673639, AI635816, AI332841, AW576111, AI925364, AA599283, BE646653, AA815259, AI093865, AA557291, AA992639, AI199140, AI094047, AA778372, AA777994, BF110030, AA700564, AW236389, AW405247, AI376136, AW195935, AA418750, AA418959, AA809375, AI378198, W47086, AA258421, AA833614, AA722806, AW135756, AI312116, N26019, AI401448, BE047114, AI004747, N36650, AA297567, AA975019, AA369324, F32728, AW592186, AA298693, AA248246, AA214511, AA298744, AA28186, R01364, AA651996, AI382499, AA215364, AW241153, AW167882, AI038732, AL514627, AL514919, AV681857, AL513907, AA421957, AV756703, AL514473, AL513597, AL514791, AV682351, AI567360, AL135661, AI679916, AV756477, AL513803, AW087445, AV726951, BF904180, AL514691, BF792469, AV682330, BF726603, AV710479, AV706777, AV682266, BE965432, BE966388, AV758179, BG105099, BG257535, BE879906, AI499381, AW162071, AV717725, BG179993, BG112879, BF681080, BE964614, AI349772, AV682222, AL514155, AV757598, AL120854, BG036846, BF969484, BF971016, AV755207, AA640779, AV729334, AI633419, AI282903, AW301409, AI569616, AI433976, BF925729, AV682249, AV755581, BE963035, BG110517, BG109270, BG120816, BF343241, AI537677, BF970449, AW827289, BF883916, AL514935, BF724691, BE965481, BG122481, AL079963, AW103371, BG110684, AL513763, AI799199, AL036802, BF812933, AI868831, AV723953, BE048071, AI857296, BF904258, BF882343, BF795712, AV721967, AI678357, AL119863, AI521012, BF055737, BE964812, BG260037, AI498579, AV756560, AL045500, AW071349, BG105078, AW088899, BF344652, BF054789, BE964700, BG168696, AL048871, AI696626, AW068845, AI612913, AI572418, AI783792, AW238730, N80094, AI802240, BG180996, BG256950, AV757455, AL040243, AV681668, AI610645, AW983783, AI250663, BE876038, AI538085, AI620287, BF970162, AI702433, AL119791, AL045903, AI567351, AI280661, BE621256, AI537617, BF342070, AV682792, AI872914, BF034349, BG027082, BG108324, AA572758, AL036146, AV733824, AV681987, AV757096, AV758806, AI538716, AV755613, BF694790, AW268253, AI591316, BF726160, AI636456, AV682326, BF981774, AL121328, AI312428, AI281779, AI584140, BF673434, BG031815, AI930664, AV729890, AI680498, AV686346, AI682743, AW071417, BF792961, AI349004, BE881155, AV714975, BE966443, AI648663, AW148320, AI340582, BG250190, AI500077, AI349645, AV682051, AW149236, AI224992, AI289937, AI906328, AV716613, AV699193, AI564719, AI922676, BF343172, AW074993, AI349614, BG032208, BE781369, BE172767,

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HWBCP79	585	846382	1 - 1124	15 - 1138	AW935696, BF358707, BF338705, BF347791, BF674036, BE394054, BF945587, AA503600, BF347740, BF915002, AA169263, BF030530, AA580808, AA630672, AA127426, F12561, AV762741, AA828749, F34498, AV760634, BE005691, AA362349, BE790132, AA584876, AA838190, AL801482, BF149427, AL708009, BC059568, D52587, AA316905, M86120, AL121870.9, AL031255.1, AL135838.5, AC009533.9, AC002565.1, AE006462.1, Y18000.1, AC011895.4, AF312032.1, AC005529.7, AC006432.15, AC002094.1, AC005523.1, AP000350.1, AC007242.3, AC005087.2, AL163195.5, AC004882.2, AC018809.4, Z99716.4, Z83844.5, AL357075.17, AP000009.2, AP000150.1, AC006241.1, AC006251.3, AC007193.1, AC020893.5, U78027.1, AL031281.6, X76666.1, AL356983.33, AC005859.1, AC007272.3, AC007488.15, AC009570.13, AC007686.5, AL020997.1, AL499604.9, AP001965.2, AC005772.1, AL133153.3, AC005972.1, AC018637.3, AC021188.6, AC079177.21, AL445483.13, AL160414.18, AC008481.7, AC006597.2, AL136300.22, AC008753.8, AC010654.8, AC013726.7, AC007226.3, AL049870.3, AL157823.9, AC068724.7, U67825.1, AF111169.2, AC007318.4, AC004531.1, D26141.1, AC010489.4, AC007541.9, AL133405.17, Z98744.1, AP000111.1, AP000043.1, AL390074.17, AC010271.6, AC003690.1, AF241728.1, AL133418.4, AP001870.2, AC078878.20, AC004638.1, AL590762.1, AC005592.1, AL139809.16, AL136132.15, Z93023.1, AL009181.1, Z86090.10, AC005952.1, AC004953.1, AC005081.3, AC009086.5, AF001716.1, U47924.1, AC010422.7, AF283321.1, Z96074.4, AL117350.12, Z97192.2, AC020916.7, AC018821.4, AC011475.6, AL034451.26, U95090.1, AL590763.1, AC006120.1, AL356057.12, AC010126.3, AF114156.1, AL162390.9, AP003534.1, AL133243.1, AL162729.8, AL139054.1, AC003035.1, AB047869.1, AC005846.1, AL158052.10, AC009032.7, AC002455.1, Z83820.1, AC008891.7, AL163760.4, Z82182.2, AC007536.9, AC010519.6, AL138756.23, AC009475.4, AC005703.2, AC009779.18, AL358434.16, AL161629.10, AL391241.21, AC022212.4, AC008863.7.
HWBDP28	586	1352265	1 - 1827	15 - 1841	BE889490, AV722484, BF939302, BF925193, BF675397, BF925185, AI885403, BF894252, BF437150, BF511298, BF925900, AI970784, AI669189, AW402243, AI635202, AI669779, AI241438, AW571832, AI473658, AW291412, BF925180, AA374925, AI612948, BF925863, BE885616, AK026147.1, M73469.1.
HWBEM1 8	587	949402	1 - 6715	15 - 6729	BF970102, BF968719, BF982135, BE8870739, BG177864, AW960084, AA502912, BE258859, BG248298, AI050870, AW006390, BE251201, AL119604, AW503626, AW499634, AW401673, AI440347, AA310795, BG002481, AW501564, BE936524, AW501912, AW502940, AW501421, AW574552, AA524413, AW501492, AA524099, BF880552, BF313383, AV721883,

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HWBFES7	588	907063	1 - 1119	15 - 1133	BF893888, BE247495, BF736575, AF328787.1, AF250238.1, AF140342.1.
HWDAC39	589	1310817	1 - 739	15 - 753	AI685116, AW827247, AA446110, AL038713, AW838167, AI627336, AI377100, AI635355, AV652234, AW962432, AI610326, BE158597, BF949364, BF764903, AW102963, BF438919, BE973780, AI186380, AI220812, AI193408, AI873822, AV740374, AI598077, AI382347, BE873986, AI572522, AI926394, AI092624, AV744706, AI245554, AI053905, AI559986, BE048806, AI805962, BF092872, AW090566, AI758697, AI157902.6, AC007390.3, AC017082.4, AC013604.9, AC083875.1, AC002385.1, AI157938.22, AC005209.1, AI135938.9, AC017006.4, AC006198.1, AL031736.16, AL133370.4, AL390057.12, AC078958.30, AC009405.3, AL359292.12, AL136164.8, AL158192.15, AL138703.10, AC004848.1, AC007877.3, AC010590.7, AC008739.5, AL445433.14, AL353707.14, AL158015.9, AL079304.3, AL121857.5, AC025436.2, AC011361.4, AC020915.6, AL354736.10, AC021188.6, Z82216.1, AC016398.5, AL391811.7, AL162853.17, AL356019.5, AC008059.2, AL392087.7, AC061958.11, AL121841.5, AL591291.1, AC016720.9, AC016770.10, AC027239.5, AL365227.19, AC012003.9, AL139090.11, AC007482.7, AL034561.5, AL355305.9, AC025445.4, AL161665.5, AL109852.13, AL078614.2, AL390838.26, AL160273.9, AL356115.9, AL391379.12, Z98749.11, Z93018.1, AP002534.1, AL161417.17, AJ271735.1, AL035246.13, AC025613.14, AL021393.1, AC007649.12, AL353633.13, AP001671.1, AC006313.1, AL357559.16, AL355382.6, AP002364.3, AP002751.3, AL162495.18, AL035078.32, AL033525.10, AC021017.4, Z94721.1, AC013357.19, AC018514.7, AL391495.16, AC074344.5, AL512368.9.



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HWD4H3 8	590	1028519	1 - 1590	15 - 1604	AA410788, AU147162, AW069227, AW805539, AI278089, AW578373, BF769368, AW054995, AI733856, AI890324, AW849032, AI923052, AA547979, AU144540, AI634187, AI056177, AA847499, BF681619, AW861303, AW500029, AA916430, AV762633, AI457313, AA228778, BG250286, AI732389, AI754653, BE138594, BF675251, AI537020, AW973992, AA158190, AI679002, AW168433, AI891080, AW514662, AL079734, BE062159, AA515728, AA491423, BF832074, AA832145, BE897079, AW674631, AW798093, BF725178, AI049630, AW068596, AA579179, BG115297, AW004884, AW084445, AI923050, AW575000, AI282479, AU152561, AL120282, BF917346, AW338035, AW338021, AL038842, AA719073, AV762009, T09219, AW971987, AW338179, AA669155, AA502991, BG222875, AI279417, AA491955, AA236867, AA640710, AW872575, AI254770, AA223174, BE042511, AI821714, AI791913, AV756491, AI284126, AI792133, AI821785, BE139139, AI251034, AA176604, AW302315, AA569648, BG236628, AV759518, AA714110, AI133164, AC008481.7, AE006639.1, AC006057.5, AL049776.3, AC004846.2, AL035404.20, AC008397.7, AL355593.21, AC002544.1, AL031311.1, AL590762.1, AC002045.1, AI400877.1, AP001051.1, AC004882.2, AC004840.3, AC008623.4, AP000046.1, AF129756.1, AC007021.3, AL136526.27, AL133367.4, AC007957.36, AL513131.1, AC008569.6, AC008687.4, AL137077.31, AL359252.17, AC010543.8, AC007216.2, AC016601.6, AC011449.6, Z83844.5, AF038458.1, AC008891.7, Z83845.14, AC007686.5, AL050318.13, AC011500.7, AC004024.2, AL022323.7, AC002073.1, AC019184.3, AL359236.4, AF288742.1, Z95115.1, AC003667.1, AL445222.9, AC008280.4, AL353802.14, AC010616.5, AC009131.6, AC004531.1, AP001721.1, AL358777.12, AL139317.5, AC005037.2, AL031666.6, AC002553.1, AL359092.14, AL163300.2, AL162426.20, AL163249.2, AF047825.1, AL079335.29, AC005015.2, U95740.1, AL133163.2, AL121586.31, AC004228.2, AC005049.2, AC004867.5, AL118520.26, AL391833.10, AC002365.1, AP000356.1, AC090517.2, AL590763.1, AC008395.6, AL139415.10, AL031717.11, AL354864.16, AC009996.7, AP001718.1, AC008543.7, AL354735.14, AC005079.6, AF243527.1, AC080012.20, AC005280.3, AL033518.14, AL354760.11, AL035406.25, AC040160.4, AC034193.4, AL356915.19, AC079177.21, AC005488.2, AC020917.4, AC008812.7, AC018663.3, AC005052.2, AP001724.1, AC005972.1, AC051619.7, AC006441.13.

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HWHGQ4 9	592	1352257	1 - 971	15 - 985	

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HWHGUS 4	593	695695	1 - 1431	15 - 1445	AA458648, BE140448, AA455546, AL132708.3, AL132990.3.
HWHGZ51	594	886212	1 - 1685	15 - 1699	BE735965, AW372956, BF826018, BE735558, AW007721, A1955624, N30735, BF842481, AA531286, BE735650, AA476961, AA479609, AA709157, N29329, BF813297, A1680020, BF814081, W72299, AW450151, BF349121, A1342682, BE713111, A1207356, BE713103, BE713065, AA459897, A1206356, W23589, BF349122, BE939515, BE714549, W76325, W35267, AW272943, AA158001, AA442947, BE713172, BG012569, T69460, AA321599, AW135072, AA369339, BE713162, A1202455, AA369441, N57021, W68131, BE713086, BE713074, T69437, BE713165, A1301772, T70492, T70513, BF738317, AW389438, BE717812, D29356, BE717821, AA127911, AA846442, AA127966, BF842499, BF739402, BE140441, BE048026, AV658585, AL037582, AL037602, BG179993, A1802542, AV741327, A1628337, BE184331, N29277, AL040241, AW079572, BF812960, BF792961, AV743962, BG114432, A1469505, AL042745, AV757865, AL079963, BF970768, A1698391, BG110684, A1499285, BE968711, BF751302, A1570807, A1345416, A1345612, BF726183, A1824576, BF724420, A1345415, BE789764, F37323, A1627988, BG256090, AL043355, BG113188, BF856052, AV658845, A1884318, A1491775, AV656595, BF924855, A1886594, BG104927, AW051088, BF032768, BG111560, AV713305, BF526020, A1540458, AA287231, AW880037, AV733448, A1288285, AW983832, BF725534, BE047852, BG029086, BF970652, AA580663, BE963838, BG167986, A1538850, A1580436, AW673679, BF055899, A1440239, A1685005, A1687295, BG058150, AA833760, AA225339, A1241923, A1568138, BE018334, BG033723, BF054877, BG115626, BF338002, AL042744, AW303152, BG001235, A1673363, BG030364, AW090393, A1783997, AL042191, BF812938, BF752245, BF727091, A1670009, AV718258, AW020561, A1433157, A1818358, A1702073, A1473536, BF911521, AV757052, BF868489, AV682124, A1682798, T95813, BF812961, A1570966, AL036214, A1345778, A1932794, AW163834, BE879108, AW827206, A1564259, BG110682, BG058398, AA641818, A1633125, A1866040, BE535384, A1538564, A1638798, AW161156, A1915291, AW152182, BG117375, AW051059, BF811804, AV681993, BG166654, A1866770, AL041150, AW104141, A1800440, BE877904, BF086116, A1433590, BE069120, AA806720, BE778453, BG180605, AL036673, BG112456, A1969655, AV733734, AL514887, AW827103, BG028116, BE964614, A1539847, A1863191, A1254727, AL039086, A1445992, BF885081, A1345608, BG029667, A1345688, AW083573, A1572717, AL036631, BF816037, A1613038, AW834302, BF909758, AW026882, AL038445, A1868931, R36271, BF872365, BG110517.

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HW/HHL34	595	805642	1 - 1515	15 - 1529		AL529775, AL533489, AL524594, BF974297, AL516570, BG163363, BE881103, AL146476, BG120063, BE259554, BF342974, AV715318, BE789938, BG105343, AV755514, BE780157, BF691658, AW812911, BG024181, AW812981, BF213502, AV716562, BF698515, BG261045, BF574514, BF211692, BF033068, BF348164, AV759171, AV701423, BF035763, AW955608, AW812971, AW581981, BF677888, BF571378, BF576293, BF240656, AW390493, BE222633, BF690640, BF576363, AW813018, BF699331, AV714362, BF978687, BE866124, BF672111, BF674211, BF670420, BE866568, AV755701, A1814859, BF665931, N92494, A1829932, BF698791, BF031127, W02193, BF671702, BF982689, BF184136, BF673226, W52978, AV681672, A1523284, AV753993, BF104739, AA192376, AW581987, AW390508, BF692915, AW367258, BF693474, BF977859, AA714791, BF036599, BF575352, BF671401, BE967567, BF242452, AV712182, BE891500, BF216657, BF681132, BF791182, AV716096, BE873981, AV733846, AW444946, BF031577, BE042514, BF215151, BF670720, BF573310, BF338919, AV712127, AV755085, AW369344, BE568177, BF213846, C05938, AL524593, BF243276, BF031685, BE973611, BF671286, AA309028, AW367331, BG258889, BF248358, BF693807, C14373, BF673387, BF666055, A1570372, BF970299, BF694056, A1886726, BF693641, AV751806, BF697207, C17464, AV759457, A1934573, BF214152, AA071179, BF819215, BF840383, BF131605, A1142543, BF755523, BF573716, BF574652, AA143582, BF106013, A1124903, AW162310, BF676442, BE855418, AA608786, BF239036, D59738, AL119812, BE874284, BF032570, AA430087, AW160345, BE961116, BF241468, BF843268, BF240051, AA977077, W16602, AA835662, AA080889, AA278398, BE568227, AW516026, A1066530, AA069804, AA569765, A1143310, AA665803, A1360862, A1277781, A1374863, A1138742, BG10683, BF693336, BE439719, BF988814, AA074132, A1376131, AV756060, BF675761, A1031953, A1953405, BF000793, AA928916, BE939314, AV755293, BF208002, AA446457, AA453448, BF575432, AA036868, AA904672, T93097, BE565473, A1684677, D59612, AV717305, A1167882, BF836349, A1300824, BF246928, R83429, AA583427, D80223, BF432205, R78724, BF671408, AA187223, BE549552, AW016459, AA009661, A1267156, A1687932, BF998029, AV609216, W58390, R83437, A1091900, AA846357, BE866710, AV648956, A1075421, A1752663, AV744633, AV734138, AW401449, BF196720, AA078834, BF571477, A1032001, BF369911, A1057310, AW149028, AW836319, D80244, A1077911, AA143583, AA309029, BF382245, A1640870, A1934317, AA810465, BF239551, AA835669, C18148, N20411, BE866744, BF243507, AA932432, N44506, AA083615, AA724827, AA612714, AA775846, AF125530.1, BC005143.1, AF070523.1, AF064854.1, T92495, T93191, T86811, T97284, T97396, R39633, R82460, H00317, H00365, H03492, H03590.

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					AA677440, AW994068, AA368613, AW052024, AI633325, AA865554, AA011059, AA011060, AW955888, AI156208, BE177677, AF198488.1, AL137740.1.
					AW663887, AA702920, AI042498, BF981980, AA661749, AW401902, AI286001, AW237708, AA512902, AW503623, BE645601, AW405179, AW973049, Z39825, AA129086, AL134524, AW972845, AW975037, AW979204, AW975032, AW976024, AW979127, AW97292, AW975002, AW975965, AW975628, AW970942, AW861944, AW969988, AW971403, AW979098, AW975105, AW858525, AW975019, AW972849, AW025744, AW974801, AW971404, AW975954, AW877209, AW975031, AW969791, AW979002, AW974786, AI088353, AW973219, AW972867, AW979238, AL119324, AW971375, AW979212, AW970540, AW979090, AW979176, AW975154, AW979294, AW970079, AW973397, AW969673, AW971968, AW973717, AW976023, AW975971, AW969885, AW975876, AW975952, AW975649, AW969643, AW975020, AW975254, AW975025, AW975650, AW969680, AW974964, AW979106, AW858522, AW975981, AI824626, AW975942, AW970070, AW975028, AW968181, AW975027, AW975990, AW975434, AW970969, AW975966, AW975632, AW972680, AW976511, AW968212, AW974823, AW974975, AW969839, AW974338, AW973750, AW969816, AW974658, AW972296, AW971732, AW979169, AW969852, AW976000, AW976031, AW974785, AW969793, AW972721, AW979220, AW971975, AW969911, AW979219, AW970936, AW975230, AW975596, AW969637, AW975015, AW858455, AW968347, AW976982, AW979173,

AW972880, AW972817, AW969748, AW975244, AW970050, AW975930, AW969861, AW975585, AW979147, AW973819, AW979142, AW974101, AW858526, AW970101, AW972154, AW968207, AW968204, AW451860, AW975022, AW971378, AW979232, AW970889, AW973214, AW975959, AW973254, AW972649, AW979133, AW979113, AW973785, AA456016, AW973654, AW969785, AW979208, AW970927, AW979211, AW974802, AW971326, AW971305, AW970107, AW976506, AW975626, AW970010, AW970113, AW976035, AW975231, AW975149, AW975084, AW972884, AW970025, AW972695, AW973805, AW972719, AW976515, AW969633, AW975921, AW969921, AW975157, AW979165, AW979054, AW971254, AW976510, AW971954, AW975941, AW974089, AW973230, AW975975, AW969778, AW969884, AW972943, AW969759, AW979083, AW970587, AW979175, AW979037, AW973986, AW979064, AW975938, AW975016, AW970921, AW969766, AW979116, AW972806, AW973987, AW972706, AW973164, AW973824, AW970097, AW974393, AW970094, AW971964, AW975904, AW974379, AW969752, AW973718, AW973967, AW975933, AW973734, AW973207, AW972882, AW973104, AW969782, AW970868, AW972868, AW973985, AW975648, AW973821, AW971129, AW969930, AW972864, AW979178, AW969658, AW972883, AW979081, AW972933, AW975162, AW971183, AW971387, AW970110, AW972705, AW972827, AW973946, AW976012, AW972823, AW970389, AW971259, AW971350, AW975261, AW971367, BC008596.1, AK001798.1, AL122101.1, AL133053.1, AL136763.1, AL133049.1, AL133074.1, AL136755.1, AL136758.1, AL133076.1, AL136764.1, AL136762.1, DI7247.1, AL133082.1, AJ276251.1, AJ276253.1, AJ276255.1, AJ276256.1, AL133068.1, AB026436.1, AL136825.1, AJ276254.1, AL133655.1, AF141306.1, AL133020.1, AF002985.1, AF126531.1, Z69719.1, AE006462.1.					
HYAAJ71	599	826754	1 - 3323	15 - 3337	AW718385, AV718481, AV659465, AV659453, AV659577, BF894682, AV704375, AI284640, AA581903, AL046205, AW576391, AW265385, AI334443, BG249643, AW265393, AW301350, AW270270, AW303196, AW502975, AI307201, AL046409, AI345654, AL042853, BG171422, AF330238, AI076616, AA533333, AI538852, BF680041, AA526787, AL037683, AI355206, AV738303, AV710066, AA584082, BF679304, AA491284, AI270117, AW419262, AW103758, AA468022, BF677892, BF816072, AI431303, AV730952, BG109996, AW274349, BF918590, AI469968, AI537506, AW274346, BG107801, AW193265, AI368256, BF991286, AV658688, AV652936, AI963720, BF678911, AL120687, AA584201, AA490183, BF683672, AW438643, AV658733, AI281881, BF592200, AA126450, AL042420, AW872676, AW731867, AI148277, AA468131, BF813686, BF592311, AV740801, AW020992, AV763550, BF676981, BF914859, AV762009, AA610491, AI613280, AW473163, AW072587, AV710770, AV762959, AW162489, AW270382, BF724372, AI375542, AV761631, AV702857, AA521323, BF679274, AU148742, BE049095, AI358571, AI956131, BF725315, AW500353, AA584167, AW088718, AW872575, AI610376, AA629572, AL041690, BE967369, AV764398, AW970848, AA720702, AU145393, BF919090, AV757607, AI287651, AA613345, BF984160, AI432270, AI890918, AV759172, AF074677, AV739901, BF680639, AV764530, AW975425, AI718446, AW129001.

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					<p>AP001700.1, AL136338.4, AC073492.18, AC003393.1, AL035411.27, AC007561.4, AL354932.26, AL080242.11, AC020901.8, AC034198.6, AC004686.1, AL139021.6, AP000959.2, AL138726.12, AC004166.12, AC007014.1, AL353807.18, AL035659.22, AL049692.13, AC016601.6, AC005189.1, AL391833.10, AC005209.1, AC078878.20, AL450265.11, AC004678.1, AC011286.7, AC005940.3, AL162853.17, AC018719.4, AC084865.2, AP001716.1, AC004019.20, AL023280.1, AF200465.1, AL023807.6, AL359835.10, AC005375.4, AL451075.15, AC004213.1, AL136358.13, AC005694.3, AC026391.6, AC023473.3, AL356094.11, AC009144.5, AC015801.25, AL162426.20, AC005900.1, AC078846.2, AE006462.1, AL359236.4, AL356481.16, AC016894.7, AL355497.14, AL136969.7, AL359265.8, AP003466.2, AL008715.1.</p>
HYBAR01	600	610383	1 - 1426	15 - 1440	<p>AA731705, AV658139, AI183463, AW976648, N75789, AU118146, N22568, AW295682, BF112103, AV688241, AA835936, AV690639, AV687139, AA429414, AW812825, AA904600, AW978315, AC011290.3, AL158141.14, AL160155.19, AL035699.4, AL022165.1, AF029081.1, AC008427.7, AC004873.3, AC004835.2, AL353140.12, AC004890.2, AL034380.26, AC009948.3, AL109798.19, AL031466.1, AC016612.5, AL359081.10, AL136977.8, AC006251.3, AC007740.2, AL445926.5, AC006543.7, AC003065.1, AL137119.26, AC008456.5, AC005033.1, AL445528.16, AL022163.1, AC006544.19, AC005913.2, AC005191.1, AC024083.3, AL023583.25, AC015987.5, AC002300.1, AP000426.3, AC011994.10, AL512448.9, AL356020.3, AL355512.22, AC023595.18, AC018634.3, AL136305.14, AC004511.1, AL445923.10, AC011904.3, AL031054.1.</p>
HYBBE75	601	834784	1 - 824	15 - 838	AL122020.5, AL159191.4.
HAPSA79	602	846517	1 - 4372	15 - 4386	<p>AL524621, AL521404, AL521403, AL524622, AW978618, AL529722, BG256352, BE909801, BE783472, AW953057, W60630, AA149513, W29012, BP968833, BE783711, AA149644, AW965598, AW977554, BE834598, AA306190, AA404374, AA928795, AW026671, AA733045, AW051295, AI131505, AI139050, AW162934, AI144018, BE855656, AI089282, W76344, AI571763, AI351676, W60631, AV718844, AW005213, AA146937, AI146486, AW262622, AI557215, AV724987, AV707088, AV656240, AV701538, AV702954, AA635131, AV727103, AV701728, AA780109, AV652156, AV728715, AV709935, AV729220, AV706527, AV706183, AV709407, AV728270, AV704592, AV702026, AV702427, AV703012, AV703591, AV706910, AV728872, AV704924, AV726505, AV705047, AV706851, AV647654, BF366791, AV704974, AV645778, AV728436, AV707171, AV707798, AV687176, AV728289, AV701496, AV709356, AV702787, AV705416, AV725387, AV685688, AV702798, AV702498, AV702409, AV702984, AV726480, AV687909, AV697638, AV705234, BF734995, AV726559, AV707948, AV701560, AV702671, AV702869, AV729983, AV729129, AV705263, AV689800, AV704116, AV705504, AV707117, W74364, AV707783, AV707589, AV706683, AV703417, AV706104, AA978196, AV704611, AV703232, AV726392, AV704981, AV701611, AV704279, AV652808, AV726830, AV727355, AV706047, AV702637, AV729357, AV653845, AV701783, AV702537, AV706989.</p>

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**Description of Table 4**

- Table 4 provides a key to the tissue/cell source identifier code disclosed in Table 1B.2, column 5. Column 1 provides the tissue/cell source identifier code disclosed in Table 1B.2, column 5. Columns 2-5 provide a description of the tissue or cell source. Note that "Description" and "Tissue" sources (i.e. columns 2 and 3) having the prefix "a\_" indicates organs, tissues, or cells derived from "adult" sources. Codes corresponding to diseased tissues are indicated in column 6 with the word "disease." The use of the word "disease" in column 6 is non-limiting. The tissue or cell source may be specific (e.g. a neoplasm), or may be disease-associated (e.g., a tissue sample from a normal portion of a diseased organ). Furthermore, tissues and/or cells lacking the "disease" designation may still be derived from sources directly or indirectly involved in a disease state or disorder, and therefore may have a further utility in that disease state or disorder. In numerous cases where the tissue/cell source is a library, column 7 identifies the vector used to generate the library.

TABLE 4

Code	Description	Tissue	Organ	Cell Line	Disease	Vector
AR022	a_Heart	a_Heart				
AR023	a_Liver	a_Liver				
AR024	a_mammary gland	a_mammary gland				
AR025	a_Prostate	a_Prostate				
AR026	a_small intestine	a_small intestine				
AR027	a_Stomach	a_Stomach				
AR028	Blood B cells	Blood B cells				
AR029	Blood B cells activated	Blood B cells activated				
AR030	Blood B cells resting	Blood B cells resting				
AR031	Blood T cells activated	Blood T cells activated				
AR032	Blood T cells resting	Blood T cells resting				
AR033	brain	brain				
AR034	breast	breast				
AR035	breast cancer	breast cancer				
AR036	Cell Line CAOV3	Cell Line CAOV3				
AR037	cell line PA-1	cell line PA-1				
AR038	cell line transformed	cell line transformed				
AR039	colon	colon				
AR040	colon (9808co65R)	colon (9808co65R)				
AR041	colon (9809co15)	colon (9809co15)				
AR042	colon cancer	colon cancer				
AR043	colon cancer (9808co64R)	colon cancer (9808co64R)				
AR044	colon cancer 9809co14	colon cancer 9809co14				
AR050	Donor II B Cells 24hrs	Donor II B Cells 24hrs				
AR051	Donor II B Cells 72hrs	Donor II B Cells 72hrs				
AR052	Donor II B-Cells 24 hrs.	Donor II B-Cells 24 hrs.				
AR053	Donor II B-Cells 72hrs	Donor II B-Cells 72hrs				

AR054	Donor II Resting B Cells	Donor II Resting B Cells							
AR055	Heart	Heart							
AR056	Human Lung (clonotech)	Human Lung (clonotech)							
AR057	Human Mammary (clonotech)	Human Mammary (clonotech)							
AR058	Human Thymus (clonotech)	Human Thymus (clonotech)							
AR059	Jurkat (unstimulated)	Jurkat (unstimulated)							
AR060	Kidney	Kidney							
AR061	Liver	Liver							
AR062	Liver (Clonotech)	Liver (Clonotech)							
AR063	Lymphocytes chronic lymphocytic leukaemia	Lymphocytes chronic lymphocytic leukaemia							
AR064	Lymphocytes diffuse large B cell lymphoma	Lymphocytes diffuse large B cell lymphoma							
AR065	Lymphocytes follicular lymphoma	Lymphocytes follicular lymphoma							
AR066	normal breast	normal breast							
AR067	Normal Ovarian (4004901)	Normal Ovarian (4004901)							
AR068	Normal Ovary 9508G045	Normal Ovary 9508G045							
AR069	Normal Ovary 9701G208	Normal Ovary 9701G208							
AR070	Normal Ovary 9806G005	Normal Ovary 9806G005							
AR071	Ovarian Cancer	Ovarian Cancer							
AR072	Ovarian Cancer (9702G001)	Ovarian Cancer (9702G001)							
AR073	Ovarian Cancer (9707G029)	Ovarian Cancer (9707G029)							
AR074	Ovarian Cancer (9804G011)	Ovarian Cancer (9804G011)							
AR075	Ovarian Cancer (9806G019)	Ovarian Cancer (9806G019)							
AR076	Ovarian Cancer	Ovarian Cancer (9807G017)							

AR077	(9807G017) Ovarian Cancer (9809G001)	Ovarian Cancer (9809G001)					
AR078	ovarian cancer 15799	ovarian cancer 15799					
AR079	Ovarian Cancer 17717AID	Ovarian Cancer 17717AID					
AR080	Ovarian Cancer 4004664B1	Ovarian Cancer 4004664B1					
AR081	Ovarian Cancer 4005315A1	Ovarian Cancer 4005315A1					
AR082	ovarian cancer 94127303	ovarian cancer 94127303					
AR083	Ovarian Cancer 96069304	Ovarian Cancer 96069304					
AR084	Ovarian Cancer 9707G029	Ovarian Cancer 9707G029					
AR085	Ovarian Cancer 9807G045	Ovarian Cancer 9807G045					
AR086	ovarian cancer 9809G001	ovarian cancer 9809G001					
AR087	Ovarian Cancer 9905C032RC	Ovarian Cancer 9905C032RC					
AR088	Ovarian cancer 9907 C00 3rd	Ovarian cancer 9907 C00 3rd					
AR089	Prostate	Prostate					
AR090	Prostate (clonotech)	Prostate (clonotech)					
AR091	prostate cancer	prostate cancer					
AR092	prostate cancer #15176	prostate cancer #15176					
AR093	prostate cancer #15509	prostate cancer #15509					
AR094	prostate cancer #15673	prostate cancer #15673					
AR095	Small Intestine (Clontech)	Small Intestine (Clontech)					
AR096	Spleen	Spleen					
AR097	Thymus T cells activated	Thymus T cells activated					
AR098	Thymus T cells resting	Thymus T cells resting					
AR099	Tonsil	Tonsil					
AR100	Tonsil germinal center centroblast	Tonsil germinal center centroblast					
AR101	Tonsil germinal center B	Tonsil germinal center B cell					

AR102	cell	Tonsil lymph node	Tonsil lymph node						
AR103		Tonsil memory B cell	Tonsil memory B cell						
AR104		Whole Brain	Whole Brain						
AR105		Xenograft ES-2	Xenograft ES-2						
AR106		Xenograft SW626	Xenograft SW626						
AR119		001: IL-2	001: IL-2						
AR120		001: IL-2.1	001: IL-2.1						
AR121		001: IL-2_b	001: IL-2_b						
AR124		002: Monocytes untreated (1hr)	002: Monocytes untreated (1hr)						
AR125		002: Monocytes untreated (5hrs)	002: Monocytes untreated (5hrs)						
AR126		002: Control.1C	002: Control.1C						
AR127		002: IL2.1C	002: IL2.1C						
AR130		003: Placebo-treated Rat Lacrimal Gland	003: Placebo-treated Rat Lacrimal Gland						
AR131		003: Placebo-treated Rat Submandibular Gland	003: Placebo-treated Rat Submandibular Gland						
AR135		004: Monocytes untreated (5hrs)	004: Monocytes untreated (5hrs)						
AR136		004: Monocytes untreated 1hr	004: Monocytes untreated 1hr						
AR139		005: Placebo (48hrs)	005: Placebo (48hrs)						
AR140		006: pC4 (24hrs)	006: pC4 (24hrs)						
AR141		006: pC4 (48hrs)	006: pC4 (48hrs)						
AR152		007: PHA(1hr)	007: PHA(1hr)						
AR153		007: PHA(6hrs)	007: PHA(6hrs)						
AR154		007: PMA(6hrs)	007: PMA(6hrs)						
AR155		008: 1449_#2	008: 1449_#2						
AR161		01: A - max 24	01: A - max 24						
AR162		01: A - max 26	01: A - max 26						

AR163	01: A - max 30	01: A - max 30					
AR164	01: B - max 24	01: B - max 24					
AR165	01: B - max 26	01: B - max 26					
AR166	01: B - max 30	01: B - max 30					
AR167	1449 Sample	1449 Sample					
AR168	3T3P10 1.0uM insulin	3T3P10 1.0uM insulin					
AR169	3T3P10 10nM Insulin	3T3P10 10nM Insulin					
AR170	3T3P10 10uM insulin	3T3P10 10uM insulin					
AR171	3T3P10 No Insulin	3T3P10 No Insulin					
AR172	3T3P4	3T3P4					
AR173	Adipose (41892)	Adipose (41892)					
AR174	Adipose Diabetic (41611)	Adipose Diabetic (41611)					
AR175	Adipose Diabetic (41661)	Adipose Diabetic (41661)					
AR176	Adipose Diabetic (41689)	Adipose Diabetic (41689)					
AR177	Adipose Diabetic (41706)	Adipose Diabetic (41706)					
AR178	Adipose Diabetic (42352)	Adipose Diabetic (42352)					
AR179	Adipose Diabetic (42366)	Adipose Diabetic (42366)					
AR180	Adipose Diabetic (42452)	Adipose Diabetic (42452)					
AR181	Adipose Diabetic (42491)	Adipose Diabetic (42491)					
AR182	Adipose Normal (41843)	Adipose Normal (41843)					
AR183	Adipose Normal (41893)	Adipose Normal (41893)					
AR184	Adipose Normal (42452)	Adipose Normal (42452)					
AR185	Adrenal Gland	Adrenal Gland					
AR186	Adrenal Gland + Whole Brain	Adrenal Gland + Whole Brain					
AR187	B7(1hr)+ (inverted)	B7(1hr)+ (inverted)					
AR188	Breast (18275A2B)	Breast (18275A2B)					
AR189	Breast (4004199)	Breast (4004199)					
AR190	Breast (4004399)	Breast (4004399)					
AR191	Breast (4004943B7)	Breast (4004943B7)					
AR192	Breast (4005570B1)	Breast (4005570B1)					
AR193	Breast Cancer	Breast Cancer					



	(4004127A30)	(4004127A30)							
AR194	Breast Cancer (400443A21)	Breast Cancer (400443A21)							
AR195	Breast Cancer (4004643A2)	Breast Cancer (4004643A2)							
AR196	Breast Cancer (4004710A7)	Breast Cancer (4004710A7)							
AR197	Breast Cancer (4004943A21)	Breast Cancer (4004943A21)							
AR198	Breast Cancer (400553A2)	Breast Cancer (400553A2)							
AR199	Breast Cancer (9805C046R)	Breast Cancer (9805C046R)							
AR200	Breast Cancer (9806C012R)	Breast Cancer (9806C012R)							
AR201	Breast Cancer (ODQ 45913)	Breast Cancer (ODQ 45913)							
AR202	Breast Cancer (ODQ45913)	Breast Cancer (ODQ45913)							
AR203	Breast Cancer (ODQ4591B)	Breast Cancer (ODQ4591B)							
AR204	Colon Cancer (15663)	Colon Cancer (15663)							
AR205	Colon Cancer (4005144A4)	Colon Cancer (4005144A4)							
AR206	Colon Cancer (4005413A4)	Colon Cancer (4005413A4)							
AR207	Colon Cancer (4005570B1)	Colon Cancer (4005570B1)							
AR208	Control RNA #1	Control RNA #1							
AR209	Control RNA #2	Control RNA #2							
AR210	Cultured Preadipocyte (blue)	Cultured Preadipocyte (blue)							
AR211	Cultured Preadipocyte (Red)	Cultured Preadipocyte (Red)							

AR212	Donor II B-Cells 24hrs	Donor II B-Cells 24hrs					
AR213	Donor II Resting B-Cells	Donor II Resting B-Cells					
AR214	H114EP12 10nM Insulin	H114EP12 10nM Insulin					
AR215	H114EP12 (10nM insulin)	H114EP12 (10nM insulin)					
AR216	H114EP12 (2.6ug/ul)	H114EP12 (2.6ug/ul)					
AR217	H114EP12 (3.6ug/ul)	H114EP12 (3.6ug/ul)					
AR218	HUVEC #1	HUVEC #1					
AR219	HUVEC #2	HUVEC #2					
AR221	L6 undiff.	L6 undiff.					
AR222	L6 Undifferentiated	L6 Undifferentiated					
AR223	L6P8 + 10nM Insulin	L6P8 + 10nM Insulin					
AR224	L6P8 + HS	L6P8 + HS					
AR225	L6P8 10nM Insulin	L6P8 10nM Insulin					
AR226	Liver (00-06-A007B)	Liver (00-06-A007B)					
AR227	Liver (96-02-A075)	Liver (96-02-A075)					
AR228	Liver (96-03-A144)	Liver (96-03-A144)					
AR229	Liver (96-04-A138)	Liver (96-04-A138)					
AR230	Liver (97-10-A074B)	Liver (97-10-A074B)					
AR231	Liver (98-09-A242A)	Liver (98-09-A242A)					
AR232	Liver Diabetic (1042)	Liver Diabetic (1042)					
AR233	Liver Diabetic (41616)	Liver Diabetic (41616)					
AR234	Liver Diabetic (41955)	Liver Diabetic (41955)					
AR235	Liver Diabetic (42352R)	Liver Diabetic (42352R)					
AR236	Liver Diabetic (42366)	Liver Diabetic (42366)					
AR237	Liver Diabetic (42483)	Liver Diabetic (42483)					
AR238	Liver Diabetic (42491)	Liver Diabetic (42491)					
AR239	Liver Diabetic (99-09-A281A)	Liver Diabetic (99-09-A281A)					
AR240	Lung	Lung					
AR241	Lung (27270)	Lung (27270)					
AR242	Lung (2727Q)	Lung (2727Q)					
AR243	Lung Cancer (4005116A1)	Lung Cancer (4005116A1)					

AR244	Lung Cancer (4005121A5)	Lung Cancer (4005121A5)			
AR245	Lung Cancer (4005121A5))	Lung Cancer (4005121A5))			
AR246	Lung Cancer (4005340A4)	Lung Cancer (4005340A4)			
AR247	Mammary Gland	Mammary Gland			
AR248	Monocyte (CT)	Monocyte (CT)			
AR249	Monocyte (OCT)	Monocyte (OCT)			
AR250	Monocytes (CT)	Monocytes (CT)			
AR251	Monocytes (INFG 18 hr)	Monocytes (INFG 18 hr)			
AR252	Monocytes (INFG 18hr)	Monocytes (INFG 18hr)			
AR253	Monocytes (INFG 8-11)	Monocytes (INFG 8-11)			
AR254	Monocytes (O CT)	Monocytes (O CT)			
AR255	Muscle (91-01-A105)	Muscle (91-01-A105)			
AR256	Muscle (92-04-A059)	Muscle (92-04-A059)			
AR257	Muscle (97-11-A056d)	Muscle (97-11-A056d)			
AR258	Muscle (99-06-A210A)	Muscle (99-06-A210A)			
AR259	Muscle (99-07-A203B)	Muscle (99-07-A203B)			
AR260	Muscle (99-7-A203B)	Muscle (99-7-A203B)			
AR261	Muscle Diabetic (42352R)	Muscle Diabetic (42352R)			
AR262	Muscle Diabetic (42366)	Muscle Diabetic (42366)			
AR263	NK-19 Control	NK-19 Control			
AR264	NK-19 IL Treated 72hrs	NK-19 IL Treated 72hrs			
AR265	NK-19 UK Treated 72 hrs.	NK-19 UK Treated 72 hrs.			
AR266	Omentum Normal (94-08-B009)	Omentum Normal (94-08-B009)			
AR267	Omentum Normal (97-01-A039A)	Omentum Normal (97-01-A039A)			
AR268	Omentum Normal (97-04-A114C)	Omentum Normal (97-04-A114C)			
AR269	Omentum Normal (97-06-A117C)	Omentum Normal (97-06-A117C)			
AR270	Omentum Normal (97-09-)	Omentum Normal (97-09-)			

	B004C)	B004C)							
AR271	Ovarian Cancer (17717AID)	Ovarian Cancer (17717AID)							
AR272	Ovarian Cancer (9905C023RC)	Ovarian Cancer (9905C023RC)							
AR273	Ovarian Cancer (9905C032RC)	Ovarian Cancer (9905C032RC)							
AR274	Ovary (9508G045)	Ovary (9508G045)							
AR275	Ovary (9701G208)	Ovary (9701G208)							
AR276	Ovary 9806G005	Ovary 9806G005							
AR277	Pancreas	Pancreas							
AR278	Placebo	Placebo							
AR279	rIL2 Control	rIL2 Control							
AR280	RSS288L	RSS288L							
AR281	RSS288LC	RSS288LC							
AR282	Salivary Gland	Salivary Gland							
AR283	Skeletal Muscle	Skeletal Muscle							
AR284	Skeletal Muscle (91-01-A105)	Skeletal Muscle (91-01-A105)							
AR285	Skeletal Muscle (42180)	Skeletal Muscle (42180)							
AR286	Skeletal Muscle (42386)	Skeletal Muscle (42386)							
AR287	Skeletal Muscle (42461)	Skeletal Muscle (42461)							
AR288	Skeletal Muscle (91-01-A105)	Skeletal Muscle (91-01-A105)							
AR289	Skeletal Muscle (92-04-A059)	Skeletal Muscle (92-04-A059)							
AR290	Skeletal Muscle (96-08-A171)	Skeletal Muscle (96-08-A171)							
AR291	Skeletal Muscle (97-07-A190A)	Skeletal Muscle (97-07-A190A)							
AR292	Skeletal Muscle Diabetic (42352)	Skeletal Muscle Diabetic (42352)							
AR293	Skeletal Muscle Diabetic	Skeletal Muscle Diabetic							

AR294	(42366) Skeletal Muscle Diabetic (42395)	(42366) Skeletal Muscle Diabetic (42395)					
AR295	Skeletal Muscle Diabetic (42483)	Skeletal Muscle Diabetic (42483)					
AR296	Skeletal Muscle Diabetic (42491)	Skeletal Muscle Diabetic (42491)					
AR297	Skeletal Muscle Diabetic 42352	Skeletal Muscle Diabetic 42352					
AR298	Skeletal Muscle (42461)	Skeletal Muscle (42461)					
AR299	Small Intestine	Small Intestine					
AR300	Stomach	Stomach					
AR301	T-Cell + HDPBQ71.fc 1449 16hrs	T-Cell + HDPBQ71.fc 1449 16hrs					
AR302	T-Cell + HDPBQ71.fc 1449 6hrs	T-Cell + HDPBQ71.fc 1449 6hrs					
AR303	T-Cell + IL2 16hrs	T-Cell + IL2 16hrs					
AR304	T-Cell + IL2 6hrs	T-Cell + IL2 6hrs					
AR306	T-Cell Untreated 16hrs	T-Cell Untreated 16hrs					
AR307	T-Cell Untreated 6hrs	T-Cell Untreated 6hrs					
AR308	T-Cells 24 hours	T-Cells 24 hours					
AR309	T-Cells 24 hrs	T-Cells 24 hrs					
AR310	T-Cells 24 hrs.	T-Cells 24 hrs.					
AR311	T-Cells 24hrs	T-Cells 24hrs					
AR312	T-Cells 4 days	T-Cells 4 days					
AR313	Thymus	Thymus					
AR314	TRE	TRE					
AR315	TREC	TREC					
AR317	B lymphocyte,	B lymphocyte,					
AR318	(non-T; non-B)	(non-T; non-B)					
AR326	001 - 293 RNA (Vector Control)	001 - 293 RNA (Vector Control)					

AR327	001: Control	001: Control							
AR328	001: Control.1	001: Control.1							
AR355	Acute Lymphocyte Leukemia	Acute Lymphocyte Leukemia							
AR356	AML Patient #11	AML Patient #11							
AR357	AML Patient #2	AML Patient #2							
AR358	AML Patient #2 SGAH	AML Patient #2 SGAH							
AR359	AML Patient#2	AML Patient#2							
AR360	Aorta	Aorta							
AR361	B Cell	B Cell							
AR362	B lymphoblast	B lymphoblast							
AR363	B lymphocyte	B lymphocyte							
AR364	B lymphocytes	B lymphocytes							
AR365	B-cell	B-cell							
AR366	B-Cells	B-Cells							
AR367	B-Lymphoblast	B-Lymphoblast							
AR368	B-Lymphocytes	B-Lymphocytes							
AR369	Bladder	Bladder							
AR370	Bone Marrow	Bone Marrow							
AR371	Bronchial Epithelial Cell	Bronchial Epithelial Cell							
AR372	Bronchial Epithelial Cells	Bronchial Epithelial Cells							
AR373	Caco-2A	Caco-2A							
AR374	Caco-2B	Caco-2B							
AR375	Caco-2C	Caco-2C							
AR376	Cardiac #1	Cardiac #1							
AR377	Cardiac #2	Cardiac #2							
AR378	Chest Muscle	Chest Muscle							
AR381	Dendritic Cell	Dendritic Cell							
AR382	Dendritic cells	Dendritic cells							
AR383	E.coli	E.coli							
AR384	Epithelial Cells	Epithelial Cells							
AR385	Esophagus	Esophagus							

AR386	FPPS	FPPS							
AR387	FPPSC	FPPSC							
AR388	HepG2 Cell Line	HepG2 Cell Line							
AR389	HepG2 Cell line Buffer 1 hr.	HepG2 Cell line Buffer 1 hr.							
AR390	HepG2 Cell line Buffer 06 hr.	HepG2 Cell line Buffer 06 hr.							
AR391	HepG2 Cell line Buffer 24 hr.	HepG2 Cell line Buffer 24 hr.							
AR392	HepG2 Cell line Insulin 01 hr.	HepG2 Cell line Insulin 01 hr.							
AR393	HepG2 Cell line Insulin 06 hr.	HepG2 Cell line Insulin 06 hr.							
AR394	HepG2 Cell line Insulin 24 hr.	HepG2 Cell line Insulin 24 hr.							
AR398	HMC-1	HMC-1							
AR399	HMSC	HMSC							
AR400	HMSC	HMSC							
AR401	HUVEC #3	HUVEC #3							
AR402	HUVEC #4	HUVEC #4							
AR404	KIDNEY NORMAL	KIDNEY NORMAL							
AR405	KIDNEY TUMOR	KIDNEY TUMOR							
AR406	KIDNEY TUMOR								
AR407	Lymph Node	Lymph Node							
AR408	Macrophage	Macrophage							
AR409	Megakarioblast	Megakarioblast							
AR410	Monocyte	Monocyte							
AR411	Monocytes	Monocytes							
AR412	Myocardium	Myocardium							
AR413	Myocardium #3	Myocardium #3							

AR414	Myocardium #4	Myocardium #4							
AR415	Myocardium #5	Myocardium #5							
AR416	NK	NK							
AR417	NK cell	NK cell							
AR418	NK cells	NK cells							
AR419	NKYa	NKYa							
AR420	NKYa019	NKYa019							
AR421	Ovary	Ovary							
AR422	Patient #11	Patient #11							
AR423	Peripheral blood	Peripheral blood							
AR424	Primary Adipocytes	Primary Adipocytes							
AR425	Promyeloblast	Promyeloblast							
AR427	RSSWT	RSSWT							
AR428	RSSWTC	RSSWTC							
AR429	SW 480(G1)	SW 480(G1)							
AR430	SW 480(G2)	SW 480(G2)							
AR431	SW 480(G3)	SW 480(G3)							
AR432	SW 480(G4)	SW 480(G4)							
AR433	SW 480(G5)	SW 480(G5)							
AR434	T Lymphoblast	T Lymphoblast							
AR435	T Lymphocyte	T Lymphocyte							
AR436	T-Cell	T-Cell							
AR438	T-Cell,	T-Cell,							
AR439	T-Cells	T-Cells							
AR440	T-lymphoblast	T-lymphoblast							
AR441	Th 1	Th 1							
AR442	Th 2	Th 2							
AR443	Th1	Th1							
AR444	Th2	Th2							
H0002	Human Adult Heart	Human Adult Heart							Uni-ZAP XR
H0004	Human Adult Spleen	Human Adult Spleen							Uni-ZAP XR
H0008	Whole 6 Week Old								Uni-ZAP XR



	Embryo						Uni-ZAP XR
H0009	Human Fetal Brain						Uni-ZAP XR
H0011	Human Fetal Kidney	Human Fetal Kidney			Kidney		Uni-ZAP XR
H0012	Human Fetal Kidney	Human Fetal Kidney			Kidney		Uni-ZAP XR
H0013	Human 8 Week Whole Embryo	Human 8 Week Old Embryo			Embryo		Uni-ZAP XR
H0014	Human Gall Bladder	Human Gall Bladder			Gall Bladder		Uni-ZAP XR
H0015	Human Gall Bladder, fraction II	Human Gall Bladder			Gall Bladder		Uni-ZAP XR
H0016	Human Greater Omentum	Human Greater Omentum			peritoneum		Uni-ZAP XR
H0020	Human Hippocampus	Human Hippocampus			Brain		Lambda ZAP II
H0022	Jurkat Cells	Jurkat T-Cell Line					Uni-ZAP XR
H0023	Human Fetal Lung						Uni-ZAP XR
H0024	Human Fetal Lung III	Human Fetal Lung			Lung		Lambda ZAP II
H0026	Namalwa Cells	Namalwa B-Cell Line, EBV immortalized					pBluescript
H0028	Human Old Ovary	Human Old Ovary			Ovary		Uni-ZAP XR
H0030	Human Placenta	Human Placenta			Placenta		Uni-ZAP XR
H0031	Human Placenta	Human Placenta			Prostate		Uni-ZAP XR
H0032	Human Prostate	Human Prostate					Uni-ZAP XR
H0033	Human Pituitary	Human Pituitary			Small Int.		Uni-ZAP XR
H0036	Human Adult Small Intestine	Human Adult Small Intestine					Uni-ZAP XR
H0038	Human Testes	Human Testes			Testis		Uni-ZAP XR
H0039	Human Pancreas Tumor	Human Pancreas Tumor			Pancreas	disease	Uni-ZAP XR
H0040	Human Testes Tumor	Human Testes Tumor			Testis	disease	Uni-ZAP XR
H0041	Human Fetal Bone	Human Fetal Bone			Bone		Uni-ZAP XR
H0042	Human Adult Pulmonary	Human Adult Pulmonary			Lung		Uni-ZAP XR
H0044	Human Cornea	Human Cornea			eye		Uni-ZAP XR
H0045	Human Esophagus, Cancer	Human Esophagus, cancer			Esophagus	disease	Uni-ZAP XR
H0046	Human Endometrial	Human Endometrial Tumor			Uterus	disease	Uni-ZAP XR

	Tumor						
H0047	Human Fetal Liver	Human Fetal Liver	Liver				Uni-ZAP XR
H0048	Human Pineal Gland	Human Pineal Gland					Uni-ZAP XR
H0050	Human Fetal Heart	Human Fetal Heart	Heart				Uni-ZAP XR
H0051	Human Hippocampus	Human Hippocampus	Brain				Uni-ZAP XR
H0052	Human Cerebellum	Human Cerebellum	Brain				Uni-ZAP XR
H0056	Human Umbilical Vein, Endo. remake	Human Umbilical Vein Endothelial Cells	Umbilical vein				Uni-ZAP XR
H0057	Human Fetal Spleen						Uni-ZAP XR
H0058	Human Thymus Tumor	Human Thymus Tumor	Thymus			disease	Lambda ZAP II
H0059	Human Uterine Cancer	Human Uterine Cancer	Uterus			disease	Lambda ZAP II
H0060	Human Macrophage	Human Macrophage	Blood		Cell Line		pBluescript
H0061	Human Macrophage	Human Macrophage	Blood		Cell Line		pBluescript
H0063	Human Thymus	Human Thymus	Thymus				Uni-ZAP XR
H0065	Human Esophagus, Normal	Human Esophagus, normal	Esophagus				Uni-ZAP XR
H0068	Human Skin Tumor	Human Skin Tumor	Skin			disease	Uni-ZAP XR
H0069	Human Activated T-Cells	Activated T-Cells	Blood		Cell Line		Uni-ZAP XR
H0070	Human Pancreas	Human Pancreas	Pancreas				Uni-ZAP XR
H0071	Human Infant Adrenal Gland	Human Infant Adrenal Gland	Adrenal gland				Uni-ZAP XR
H0073	Human Leiomyeloid Carcinoma	Human Leiomyeloid Carcinoma	Muscle			disease	Uni-ZAP XR
H0075	Human Activated T-Cells (II)	Activated T-Cells	Blood		Cell Line		Uni-ZAP XR
H0076	Human Membrane Bound Polysomes	Human Membrane Bound Polysomes	Blood		Cell Line		Uni-ZAP XR
H0078	Human Lung Cancer	Human Lung Cancer	Lung			disease	Lambda ZAP II
H0081	Human Fetal Epithelium (Skin)	Human Fetal Skin	Skin				Uni-ZAP XR
H0083	HUMAN JURKAT MEMBRANE BOUND POLYSOMES	Jurkat Cells					Uni-ZAP XR

H0085	Human Colon	Human Colon	Epithelioid Sarcoma, muscle	Sk Muscle			Lambda ZAP II
H0086	Human epithelioid sarcoma				disease		Uni-ZAP XR
H0087	Human Thymus	Human Thymus					pBluescript
H0090	Human T-Cell Lymphoma	Human Thymus	T-Cell Lymphoma	T-Cell	disease		Uni-ZAP XR
H0097	Human Adult Heart, subtracted	Human Adult Heart, subtracted	Human Adult Heart	Heart			pBluescript
H0098	Human Adult Liver, subtracted	Human Adult Liver, subtracted	Human Adult Liver	Liver			Uni-ZAP XR
H0099	Human Lung Cancer, subtracted	Human Lung Cancer, subtracted	Human Lung Cancer	Lung			pBluescript
H0100	Human Whole Six Week Old Embryo	Human Whole Six Week Old Embryo	Human Whole Six Week Old Embryo	Embryo			Uni-ZAP XR
H0101	Human 7 Weeks Old Embryo, subtracted	Human 7 Weeks Old Embryo, subtracted	Human Whole 7 Week Old Embryo	Embryo			Lambda ZAP II
H0102	Human Whole 6 Week Old Embryo (II), subt	Human Whole 6 Week Old Embryo (II), subt	Human Whole Six Week Old Embryo	Embryo			pBluescript
H0103	Human Fetal Brain, subtracted	Human Fetal Brain, subtracted	Human Fetal Brain	Brain			Uni-ZAP XR
H0105	Human Fetal Heart, subtracted	Human Fetal Heart, subtracted	Human Fetal Heart	Heart			pBluescript
H0107	Human Infant Adrenal Gland, subtracted	Human Infant Adrenal Gland, subtracted	Human Infant Adrenal Gland	Adrenal gland			pBluescript
H0108	Human Adult Lymph Node, subtracted	Human Adult Lymph Node, subtracted	Human Adult Lymph Node	Lymph Node			Uni-ZAP XR
H0109	Human Macrophage, subtracted	Human Macrophage, subtracted	Macrophage	Blood	Cell Line		pBluescript
H0110	Human Old Ovary, subtracted	Human Old Ovary, subtracted	Human Old Ovary	Ovary			pBluescript
H0111	Human Placenta, subtracted	Human Placenta, subtracted	Human Placenta	Placenta			pBluescript
H0116	Human Thymus Tumor, subtracted	Human Thymus Tumor, subtracted	Human Thymus Tumor	Thymus			pBluescript

H0118	Human Adult Kidney	Human Adult Kidney	Kidney			Uni-ZAP XR
H0119	Human Pediatric Kidney	Human Pediatric Kidney	Kidney			Uni-ZAP XR
H0120	Human Adult Spleen, subtracted	Human Adult Spleen	Spleen			Uni-ZAP XR
H0121	Human Cornea, subtracted	Human Cornea	eye			Uni-ZAP XR
H0122	Human Adult Skeletal Muscle	Human Skeletal Muscle	Sk Muscle			Uni-ZAP XR
H0123	Human Fetal Dura Mater	Human Fetal Dura Mater	Brain			Uni-ZAP XR
H0124	Human Rhabdomyosarcoma	Human Rhabdomyosarcoma	Sk Muscle		disease	Uni-ZAP XR
H0125	Cem cells cyclohexamide treated	Cyclohexamide Treated Cem, Jurkat, Raji, and Supt Jurkat Cells	Blood	Cell Line		Uni-ZAP XR
H0128	Jurkat cells, thiouridine activated					Uni-ZAP XR
H0130	LNCAP untreated	LNCAP Cell Line	Prostate	Cell Line		Uni-ZAP XR
H0131	LNCAP + 0.3nM R1881	LNCAP Cell Line	Prostate	Cell Line		Uni-ZAP XR
H0132	LNCAP + 30nM R1881	LNCAP Cell Line	Prostate	Cell Line		Uni-ZAP XR
H0134	Raji Cells, cyclohexamide treated	Cyclohexamide Treated Cem, Jurkat, Raji, and Supt	Blood	Cell Line		Uni-ZAP XR
H0135	Human Synovial Sarcoma	Human Synovial Sarcoma	Synovium			Uni-ZAP XR
H0136	Supt Cells, cyclohexamide treated	Cyclohexamide Treated Cem, Jurkat, Raji, and Supt	Blood	Cell Line		Uni-ZAP XR
H0139	Activated T-Cells, 4 hrs.	Activated T-Cells	Blood	Cell Line		Uni-ZAP XR
H0140	Activated T-Cells, 8 hrs.	Activated T-Cells	Blood	Cell Line		Uni-ZAP XR
H0141	Activated T-Cells, 12 hrs.	Activated T-Cells	Blood	Cell Line		Uni-ZAP XR
H0144	Nine Week Old Early Stage Human	9 Wk Old Early Stage Human	Embryo			Uni-ZAP XR
H0147	Human Adult Liver	Human Adult Liver	Liver			Uni-ZAP XR
H0149	7 Week Old Early Stage Human, subtracted	Human Whole 7 Week Old Embryo	Embryo			Uni-ZAP XR
H0150	Human Epididymus	Epididymis	Testis			Uni-ZAP XR
H0151	Early Stage Human Liver	Human Fetal Liver	Liver			Uni-ZAP XR
H0154	Human Fibrosarcoma	Human Skin Fibrosarcoma	Skin		disease	Uni-ZAP XR

H0156	Human Adrenal Gland Tumor	Human Adrenal Gland Tumor	Adrenal Gland			disease	Uni-ZAP XR
H0158	Activated T-Cells, 4 hrs., ligation 2	Activated T-Cells	Blood	Cell Line			Uni-ZAP XR
H0159	Activated T-Cells, 8 hrs., ligation 2	Activated T-Cells	Blood	Cell Line			Uni-ZAP XR
H0161	Activated T-Cells, 24 hrs., ligation 2	Activated T-Cells	Blood	Cell Line			Uni-ZAP XR
H0163	Human Synovium	Human Synovium	Synovium				Uni-ZAP XR
H0165	Human Prostate Cancer, Stage B2	Human Prostate Cancer, stage B2	Prostate			disease	Uni-ZAP XR
H0166	Human Prostate Cancer, Stage B2 fraction	Human Prostate Cancer, stage B2	Prostate			disease	Uni-ZAP XR
H0167	Activated T-Cells, 24 hrs.	Activated T-Cells	Blood	Cell Line			Uni-ZAP XR
H0169	Human Prostate Cancer, Stage C fraction	Human Prostate Cancer, stage C	Prostate			disease	Uni-ZAP XR
H0170	12 Week Old Early Stage Human	Twelve Week Old Early Stage Human	Embryo				Uni-ZAP XR
H0171	12 Week Old Early Stage Human, II	Twelve Week Old Early Stage Human	Embryo				Uni-ZAP XR
H0172	Human Fetal Brain, random primed	Human Fetal Brain	Brain				Lambda ZAP II
H0176	CAMAI Ee Cell Line	CAMAI Ee Cell Line	Breast	Cell Line			Uni-ZAP XR
H0177	CAMAI Ee Cell Line	CAMAI Ee Cell Line	Breast	Cell Line			Uni-ZAP XR
H0178	Human Fetal Brain	Human Fetal Brain	Brain				Uni-ZAP XR
H0179	Human Neutrophil	Human Neutrophil	Blood	Cell Line			Uni-ZAP XR
H0180	Human Primary Breast Cancer	Human Primary Breast Cancer	Breast			disease	Uni-ZAP XR
H0181	Human Primary Breast Cancer	Human Primary Breast Cancer	Breast			disease	Uni-ZAP XR
H0182	Human Primary Breast Cancer	Human Primary Breast Cancer	Breast			disease	Uni-ZAP XR
H0183	Human Colon Cancer	Human Colon Cancer	Colon			disease	Uni-ZAP XR

	Human Colon Cancer, metastasized to live	Human Colon Cancer, metastasized to liver	Liver		disease	Lambda ZAP II
H0184	Human Colon Cancer, metastasized to live	Human Colon Cancer, metastasized to liver	Liver			Lambda ZAP II
H0187	Resting T-Cell	T-Cells	Blood	Cell Line		Uni-ZAP XR
H0188	Human Normal Breast	Human Normal Breast	Breast			Uni-ZAP XR
H0189	Human Resting Macrophage	Human Macrophage/Monocytes	Blood	Cell Line		Uni-ZAP XR
H0190	Human Activated Macrophage (LPS)	Human Macrophage/Monocytes	Blood	Cell Line		Uni-ZAP XR
H0192	Cem Cells, cyclohexamide treated, subtra	Cyclohexamide Treated Cem, Jurkat, Raji, and Supt	Blood	Cell Line		pBluescript
H0194	Human Cerebellum, subtracted	Human Cerebellum	Brain			Uni-ZAP XR
H0196	Human Cardiomyopathy, subtracted	Human Cardiomyopathy	Heart			Uni-ZAP XR
H0197	Human Fetal Liver, subtracted	Human Fetal Liver	Liver			Uni-ZAP XR
H0199	Human Fetal Liver, subtracted, neg clone	Human Fetal Liver	Liver			Uni-ZAP XR
H0200	Human Greater Omentum, fract II remake, subtracted	Human Greater Omentum	peritoneum			pBluescript
H0201	Human Hippocampus, subtracted	Human Hippocampus	Brain			Uni-ZAP XR
H0202	Jurkat Cells, cyclohexamide treated, subtraction	Cyclohexamide Treated Cem, Jurkat, Raji, and Supt	Blood	Cell Line		pBluescript
H0204	Human Colon Cancer, subtracted	Human Colon Cancer	Colon			pBluescript
H0205	Human Colon Cancer, differential	Human Colon Cancer	Colon			pBluescript
H0207	LNCAP, differential expression	LNCAP Cell Line	Prostate	Cell Line		pBluescript
H0208	Early Stage Human Lung, subtracted	Human Fetal Lung	Lung			pBluescript

H0209	Human Cerebellum, differentially expressed	Human Cerebellum	Brain			Uni-ZAP XR
H0211	Human Prostate, differential expression	Human Prostate	Prostate			pBluescript
H0212	Human Prostate, subtracted	Human Prostate	Prostate			pBluescript
H0213	Human Pituitary, subtracted	Human Pituitary				Uni-ZAP XR
H0214	Raji cells, cyclohexamide treated, subtracted	Cyclohexamide Treated Cem, Jurkat, Raji, and Supt	Blood	Cell Line		pBluescript
H0215	Raji cells, cyclohexamide treated, differentially expressed	Cyclohexamide Treated Cem, Jurkat, Raji, and Supt	Blood	Cell Line		pBluescript
H0216	Supt cells, cyclohexamide treated, subtracted	Cyclohexamide Treated Cem, Jurkat, Raji, and Supt	Blood	Cell Line		pBluescript
H0217	Supt cells, cyclohexamide treated, differentially expressed	Cyclohexamide Treated Cem, Jurkat, Raji, and Supt	Blood	Cell Line		pBluescript
H0218	Activated T-Cells, 0hrs, subtracted	Activated T-Cells	Blood	Cell Line		Uni-ZAP XR
H0219	Activated T-Cells, 0hrs, differentially expressed	Activated T-Cells	Blood	Cell Line		Uni-ZAP XR
H0220	Activated T-Cells, 4 hrs, subtracted	Activated T-Cells	Blood	Cell Line		Uni-ZAP XR
H0222	Activated T-Cells, 8 hrs, subtracted	Activated T-Cells	Blood	Cell Line		Uni-ZAP XR
H0223	Activated T-Cells, 8 hrs, differentially expressed	Activated T-Cells	Blood	Cell Line		Uni-ZAP XR
H0224	Activated T-Cells, 12 hrs, subtracted	Activated T-Cells	Blood	Cell Line		Uni-ZAP XR
H0225	Activated T-Cells, 12hrs, differentially expressed	Activated T-Cells	Blood	Cell Line		Uni-ZAP XR

H0229	Early Stage Human Brain, random primed	Early Stage Human Brain	Brain			Lambda ZAP II
H0230	Human Cardiomyopathy, diff exp	Human Cardiomyopathy	Heart	disease		Uni-ZAP XR
H0231	Human Colon, subtraction	Human Colon				pBluescript
H0232	Human Colon, differential expression	Human Colon				pBluescript
H0234	human colon cancer, metastatic to liver, differentially expressed	Human Colon Cancer, metastaticized to liver	Liver			pBluescript
H0235	Human colon cancer, metastaticized to liver, subtraction	Human Colon Cancer, metastaticized to liver	Liver			pBluescript
H0239	Human Kidney Tumor	Human Kidney Tumor	Kidney	disease		Uni-ZAP XR
H0240	C7MCF7 cell line, estrogen treated, Differential	C7MCF7 Cell Line, estrogen treated	Breast		Cell Line	Uni-ZAP XR
H0241	C7MCF7 cell line, estrogen treated, subtraction	C7MCF7 Cell Line, estrogen treated	Breast		Cell Line	Uni-ZAP XR
H0242	Human Fetal Heart, Differential (Fetal-Specific)	Human Fetal Heart	Heart			pBluescript
H0244	Human 8 Week Whole Embryo, subtracted	Human 8 Week Old Embryo	Embryo			Uni-ZAP XR
H0247	Human Membrane Bound Polysomes- Enzyme Subtraction	Human Membrane Bound Polysomes	Blood		Cell Line	Uni-ZAP XR
H0249	HE7, subtracted by hybridization with E7 cDNA	Human Whole 7 Week Old Embryo	Embryo			Uni-ZAP XR
H0250	Human Activated Monocytes	Human Monocytes				Uni-ZAP XR



H0251	Human Chondrosarcoma	Human Chondrosarcoma	Cartilage		disease	Uni-ZAP XR
H0252	Human Osteosarcoma	Human Osteosarcoma	Bone		disease	Uni-ZAP XR
H0253	Human adult testis, large inserts	Human Adult Testis	Testis			Uni-ZAP XR
H0254	Breast Lymph node cDNA library	Breast Lymph Node	Lymph Node			Uni-ZAP XR
H0255	breast lymph node CDNA library	Breast Lymph Node	Lymph Node			Lambda ZAP II
H0256	HL-60, unstimulated	Human HL-60 Cells, unstimulated	Blood	Cell Line		Uni-ZAP XR
H0257	HL-60, PMA 4H	HL-60 Cells, PMA stimulated 4H	Blood	Cell Line		Uni-ZAP XR
H0261	H. cerebellum, Enzyme subtracted	Human Cerebellum	Brain			Uni-ZAP XR
H0263	human colon cancer	Human Colon Cancer	Colon		disease	Lambda ZAP II
H0264	human tonsils	Human Tonsil	Tonsil			Uni-ZAP XR
H0265	Activated T-Cell (12hs)/Thiouridine labelledEco	T-Cells	Blood	Cell Line		Uni-ZAP XR
H0266	Human Microvascular Endothelial Cells, fract. A	HMEC	Vein	Cell Line		Lambda ZAP II
H0267	Human Microvascular Endothelial Cells, fract. B	HMEC	Vein	Cell Line		Lambda ZAP II
H0268	Human Umbilical Vein Endothelial Cells, fract. A	HUVE Cells	Umbilical vein	Cell Line		Lambda ZAP II
H0269	Human Umbilical Vein Endothelial Cells, fract. B	HUVE Cells	Umbilical vein	Cell Line		Lambda ZAP II
H0270	HPAS (human pancreas, subtracted)	Human Pancreas	Pancreas			Uni-ZAP XR
H0271	Human Neutrophil, Activated	Human Neutrophil - Activated	Blood	Cell Line		Uni-ZAP XR
H0272	HUMAN TONSILS, FRACTION 2	Human Tonsil	Tonsil			Uni-ZAP XR

H0274	Human Adult Spleen, fraction II	Human Adult Spleen	Spleen			Uni-ZAP XR
H0275	Human Infant Adrenal Gland, Subtracted	Human Infant Adrenal Gland	Adrenal gland			pBluescript
H0280	K562 + PMA (36 hrs)	K562 Cell line	cell line	Cell Line		ZAP Express
H0281	Lymph node, abnorm. cell line (ATCC #7225)	Lymph Node, abnormal cell line	Lymph Node	Cell Line		ZAP Express
H0282	HBGB's differential consolidation	Human Primary Breast Cancer	Breast			Uni-ZAP XR
H0284	Human OB MG63 control fraction I	Human Osteoblastoma MG63 cell line	Bone	Cell Line		Uni-ZAP XR
H0286	Human OB MG63 treated (10 nM E2) fraction I	Human Osteoblastoma MG63 cell line	Bone	Cell Line		Uni-ZAP XR
H0288	Human OB HOS control fraction I	Human Osteoblastoma HOS cell line	Bone	Cell Line		Uni-ZAP XR
H0290	Human OB HOS treated (1 nM E2) fraction I	Human Osteoblastoma HOS cell line	Bone	Cell Line		Uni-ZAP XR
H0292	Human OB HOS treated (10 nM E2) fraction I	Human Osteoblastoma HOS cell line	Bone	Cell Line		Uni-ZAP XR
H0293	W138 cells					Uni-ZAP XR
H0294	Amniotic Cells - TNF induced	Amniotic Cells - TNF induced	Placenta	Cell Line		Uni-ZAP XR
H0295	Amniotic Cells - Primary Culture	Amniotic Cells - Primary Culture	Placenta	Cell Line		Uni-ZAP XR
H0298	HCBB's differential consolidation	CAMA 1Ee Cell Line	Breast	Cell Line		Uni-ZAP XR
H0305	CD34 positive cells (Cord Blood)	CD34 Positive Cells	Cord Blood			ZAP Express
H0306	CD34 depleted Buffy Coat (Cord Blood)	CD34 Depleted Buffy Coat (Cord Blood)	Cord Blood			ZAP Express
H0309	Human Chronic Synovitis	Synovium, Chronic Synovitis/ Osteoarthritis	Synovium		disease	Uni-ZAP XR
H0310	human caudate nucleus	Brain	Brain			Uni-ZAP XR

H0316	HUMAN STOMACH	Human Stomach	Stomach			Uni-ZAP XR
H0318	HUMAN B CELL LYMPHOMA	Human B Cell Lymphoma	Lymph Node		disease	Uni-ZAP XR
H0320	Human frontal cortex	Human Frontal Cortex	Brain			Uni-ZAP XR
H0321	HUMAN SCHWANOMA	Schwanoma	Nerve		disease	Uni-ZAP XR
H0327	human corpus colosum	Human Corpus Callosum	Brain			Uni-ZAP XR
H0328	human ovarian cancer	Ovarian Cancer	Ovary		disease	Uni-ZAP XR
H0329	Dermatofibrosarcoma	Dermatofibrosarcoma	Skin		disease	Uni-ZAP XR
	Protuberance	Protuberans				
H0331	Hepatocellular Tumor	Hepatocellular Tumor	Liver		disease	Lambda ZAP II
H0333	Hemangiopericytoma	Hemangiopericytoma	Blood vessel		disease	Lambda ZAP II
H0334	Kidney cancer	Kidney Cancer	Kidney		disease	Uni-ZAP XR
H0339	Duodenum	Duodenum				Uni-ZAP XR
H0341	Bone Marrow Cell Line (RS4;11)	Bone Marrow Cell Line RS4;11	Bone Marrow	Cell Line		Uni-ZAP XR
H0343	stomach cancer (human)	Stomach Cancer - 5383A (human)			disease	Uni-ZAP XR
H0344	Adipose tissue (human)	Adipose - 6825A (human)				Uni-ZAP XR
H0345	SKIN	Skin - 4000868H	Skin			Uni-ZAP XR
H0346	Brain-medulloblastoma	Brain (Medulloblastoma)-9405C006R	Brain		disease	Uni-ZAP XR
H0349	human adult liver cDNA library	Human Adult Liver	Liver			pCMV Sport 1
H0350	Human Fetal Liver, mixed 10 & 14 week	Human Fetal Liver, mixed 10&14 Week	Liver			Uni-ZAP XR
H0351	Glioblastoma	Glioblastoma	Brain		disease	Uni-ZAP XR
H0352	wilm's tumor	Wilm's Tumor			disease	Uni-ZAP XR
H0354	Human Leukocytes	Human Leukocytes	Blood	Cell Line		pCMV Sport 1
H0355	Human Liver	Human Liver, normal Adult				pCMV Sport 1
H0356	Human Kidney	Human Kidney	Kidney			pCMV Sport 1
H0357	H. Normalized Fetal Liver, II	Human Fetal Liver	Liver			Uni-ZAP XR

H0359	KMH2 cell line	KMH2				ZAP Express
H0360	Hemangiopericytoma	Hemangiopericytoma			disease	
H0361	Human rejected kidney	Human Rejected Kidney			disease	pBluescript
H0362	HeLa cell line	HELA CELL LINE				pSport1
H0366	L428 cell line	L428				ZAP Express
H0369	H. Atrophic Endometrium	Atrophic Endometrium and myometrium				Uni-ZAP XR
H0370	H. Lymph node breast Cancer	Lymph node with Met. Breast Cancer			disease	Uni-ZAP XR
H0371	Eosinophils-Hypereosinophilia patient	Eosinophils-Hypereosinophilia patient			disease	Uni-ZAP XR
H0372	Human Testes	Human Testes	Testis			pCMVSPORT 1
H0373	Human Heart	Human Adult Heart	Heart			pCMVSPORT 1
H0374	Human Brain	Human Brain				pCMVSPORT 1
H0375	Human Lung	Human Lung				pCMVSPORT 1
H0376	Human Spleen	Human Adult Spleen	Spleen			pCMVSPORT 1
H0379	Human Tongue, frac 1	Human Tongue				pSport1
H0380	Human Tongue, frac 2	Human Tongue				pSport1
H0381	Bone Cancer	Bone Cancer			disease	Uni-ZAP XR
H0383	Human Prostate BPH, re-excision	Human Prostate BPH				Uni-ZAP XR
H0384	Brain, Kozak	Human Brain				pCMVSPORT 1
H0386	Leukocyte and Lung; 4 screens	Human Leukocytes	Blood	Cell Line		pCMVSPORT 1
H0388	Human Rejected Kidney, 704 re-excision	Human Rejected Kidney			disease	pBluescript
H0390	Human Amygdala Depression, re-excision	Human Amygdala Depression			disease	pBluescript
H0391	H. Meningioma, M6	Human Meningioma	brain			pSport1
H0392	H. Meningioma, M1	Human Meningioma	brain			pSport1
H0393	Fetal Liver, subtraction II	Human Fetal Liver	Liver			pBluescript
H0394	A-14 cell line	Redd-Sternberg cell				ZAP Express

H0395	AI-CELL LINE	Redd-Sternberg cell				ZAP Express
H0396	L1 Cell line	Redd-Sternberg cell				ZAP Express
H0399	Human Kidney Cortex, re-rescue	Human Kidney Cortex				Lambda ZAP II
H0400	Human Striatum Depression, re-rescue	Human Brain, Striatum Depression	Brain			Lambda ZAP II
H0402	CD34 depleted Buffy Coat (Cord Blood), re-excision	CD34 Depleted Buffy Coat (Cord Blood)	Cord Blood			ZAP Express
H0403	H. Umbilical Vein Endothelial Cells, IL4 induced	HUVE Cells	Umbilical vein	Cell Line		Uni-ZAP XR
H0404	H. Umbilical Vein endothelial cells, uninduced	HUVE Cells	Umbilical vein	Cell Line		Uni-ZAP XR
H0405	Human Pituitary, subtracted VI	Human Pituitary				pBluescript
H0406	H Amygdala Depression, subtracted	Human Amygdala Depression				Uni-ZAP XR
H0408	Human kidney Cortex, subtracted	Human Kidney Cortex				pBluescript
H0409	H. Striatum Depression, subtracted	Human Brain, Striatum Depression	Brain			pBluescript
H0410	H. Male bladder, adult	H Male Bladder, Adult	Bladder			pSport1
H0411	H Female Bladder, Adult	Human Female Adult Bladder	Bladder			pSport1
H0412	Human umbilical vein endothelial cells, IL-4 induced	HUVE Cells	Umbilical vein	Cell Line		pSport1
H0413	Human Umbilical Vein Endothelial Cells, uninduced	HUVE Cells	Umbilical vein	Cell Line		pSport1
H0414	Ovarian Tumor I, OV5232	Ovarian Tumor, OV5232	Ovary		disease	pSport1
H0415	H. Ovarian Tumor, II,	Ovarian Tumor, OV5232	Ovary		disease	pCMVSPORT 2.0

	OV5232	Human Neutrophil - Activated	Blood	Cell Line		pBluescript
H0416	Human Neutrophils, Activated, re-excision	Human Neutrophil - Activated	Blood	Cell Line		pBluescript
H0417	Human Pituitary, subtracted VIII	Human Pituitary				pBluescript
H0418	Human Pituitary, subtracted VII	Human Pituitary				pBluescript
H0419	Bone Cancer, re-excision	Bone Cancer				Uni-ZAP XR
H0421	Human Bone Marrow, re-excision	Bone Marrow				pBluescript
H0422	T-Cell PHA 16 hrs	T-Cells	Blood	Cell Line		pSport1
H0423	T-Cell PHA 24 hrs	T-Cells	Blood	Cell Line		pSport1
H0424	Human Pituitary, subt IX	Human Pituitary				pBluescript
H0427	Human Adipose	Human Adipose, left hipipoma				pSport1
H0428	Human Ovary	Human Ovary Tumor	Ovary			pSport1
H0429	K562 + PMA (36 hrs), re-excision	K562 Cell line	cell line	Cell Line		ZAP Express
H0431	H. Kidney Medulla, re-excision	Kidney medulla	Kidney			pBluescript
H0433	Human Umbilical Vein Endothelial cells, frac B, re-excision	HUVE Cells	Umbilical vein	Cell Line		pBluescript
H0434	Human Brain, striatum, re-excision	Human Brain, Striatum				pBluescript
H0435	Ovarian Tumor 10-3-95	Ovarian Tumor, OV350721	Ovary			pCMVSPORT 2.0
H0436	Resting T-Cell Library, II	T-Cells	Blood	Cell Line		pSport1
H0437	H Umbilical Vein Endothelial Cells, frac A, re-excision	HUVE Cells	Umbilical vein	Cell Line		Lambda ZAP II
H0438	H. Whole Brain #2, re-excision	Human Whole Brain #2				ZAP Express
H0439	Human Eosinophils	Eosinophils				pBluescript

H0441	H. Kidney Cortex, subtracted	Kidney cortex	Kidney			pBluescript
H0443	H. Adipose, subtracted	Human Adipose, left hiplipoma				pSport1
H0444	Spleen metastatic melanoma	Spleen, Metastatic malignant melanoma	Spleen		disease	pSport1
H0445	Spleen, Chronic lymphocytic leukemia	Human Spleen, CLL	Spleen		disease	pSport1
H0449	CD34+ cell, I	CD34 positive cells				pSport1
H0453	H. Kidney Pyramid, subtracted	Kidney pyramids	Kidney			pBluescript
H0455	H. Striatum Depression, subt.	Human Brain, Striatum Depression	Brain			pBluescript
H0457	Human Eosinophils	Human Eosinophils				pSport1
H0458	CD34+ cell, I, frac II	CD34 positive cells				pSport1
H0459	CD34+cells, II, FRACTION 2	CD34 positive cells				pCMVSPORT 2.0
H0462	H. Amygdala Depression, subtracted		Brain			pBluescript
H0477	Human Tonsil, Lib 3	Human Tonsil	Tonsil			pSport1
H0478	Salivary Gland, Lib 2	Human Salivary Gland	Salivary gland			pSport1
H0479	Salivary Gland, Lib 3	Human Salivary Gland	Salivary gland			pSport1
H0483	Breast Cancer cell line, MDA 36	Breast Cancer Cell line, MDA 36				pSport1
H0484	Breast Cancer Cell line, angiogenic	Breast Cancer Cell line, Angiogenic, 36T3				pSport1
H0485	Hodgkin's Lymphoma I	Hodgkin's Lymphoma I			disease	pCMVSPORT 2.0
H0486	Hodgkin's Lymphoma II	Hodgkin's Lymphoma II			disease	pCMVSPORT 2.0
H0487	Human Tonsils, lib I	Human Tonsils				pCMVSPORT 2.0
H0488	Human Tonsils, Lib 2	Human Tonsils				pCMVSPORT 2.0
H0489	Crohn's Disease	Ileum	Intestine		disease	pSport1

H0490	HL-60, untreated, subtracted	Human HL-60 Cells, unstimulated	Blood	Cell Line	Uni-ZAP XR
H0491	HL-60, PMA 4H, subtracted	HL-60 Cells, PMA stimulated 4H	Blood	Cell Line	Uni-ZAP XR
H0492	HL-60, RA 4h, Subtracted	HL-60 Cells, RA stimulated for 4H	Blood	Cell Line	Uni-ZAP XR
H0494	Keratinocyte	Keratinocyte			pCMVSPORT 2.0
H0497	HEL cell line	HEL cell line		HEL 92.1.7	pSport1
H0505	Human Astrocyte	Human Astrocyte			pSport1
H0506	Ulcerative Colitis	Colon	Colon		pSport1
H0509	Liver, Hepatoma	Human Liver, Hepatoma, patient 8	Liver	disease	pCMVSPORT 3.0
H0510	Human Liver, normal	Human Liver, normal, Patient # 8	Liver		pCMVSPORT 3.0
H0512	Keratinocyte, lib 3	Keratinocyte			pCMVSPORT 2.0
H0518	pBMC stimulated w/ poly I/C	pBMC stimulated with poly I/C			pCMVSPORT 3.0
H0519	NTERA2, control	NTERA2, Teratocarcinoma cell line			pCMVSPORT 3.0
H0520	NTERA2 + retinoic acid, 14 days	NTERA2, Teratocarcinoma cell line			pSport1
H0521	Primary Dendritic Cells, lib 1	Primary Dendritic cells			pCMVSPORT 3.0
H0522	Primary Dendritic cells, frac 2	Primary Dendritic cells			pCMVSPORT 3.0
H0525	PCR, pBMC I/C treated	pBMC stimulated with poly I/C			PCR II
H0528	Poly(I)/Poly(C) Normal Lung Fibroblasts	Poly(I)/Poly(C) Normal Lung Fibroblasts			pCMVSPORT 3.0
H0529	Myoloid Progenitor Cell Line	TF-1 Cell Line; Myoloid progenitor cell line			pCMVSPORT 3.0
H0530	Human Dermal	Human Dermal Endothelial			pSport1



	Endothelial Cells, untreated	Cells; untreated				
H0538	Merkel Cells	Merkel cells	Lymph node			pSport1
H0539	Pancreas Islet Cell Tumor	Pancreas Islet Cell Tumour	Pancreas		disease	pSport1
H0540	Skin, burned	Skin, leg burned	Skin			pSport1
H0542	T Cell helper I	Helper T cell				pCMV Sport 3.0
H0543	T cell helper II	Helper T cell				pCMV Sport 3.0
H0544	Human endometrial stromal cells	Human endometrial stromal cells				pCMV Sport 3.0
H0545	Human endometrial stromal cells-treated with progesterone	Human endometrial stromal cells-treated with proge				pCMV Sport 3.0
H0546	Human endometrial stromal cells-treated with estradiol	Human endometrial stromal cells-treated with estra				pCMV Sport 3.0
H0547	NTERA2 teratocarcinoma cell line+retinoic acid (14 days)	NTERA2, Teratocarcinoma cell line				pSport1
H0549	H. Epididymus, caput & corpus	Human Epididymus, caput and corpus				Uni-ZAP XR
H0550	H. Epididymus, cauda	Human Epididymus, cauda				Uni-ZAP XR
H0551	Human Thymus Stromal Cells	Human Thymus Stromal Cells				pCMV Sport 3.0
H0553	Human Placenta	Human Placenta				pCMV Sport 3.0
H0555	Rejected Kidney, lib 4	Human Rejected Kidney	Kidney		disease	pCMV Sport 3.0
H0556	Activated T-cell(12h)/Thiouridine-re-excision	T-Cells	Blood	Cell Line		Uni-ZAP XR
H0559	HL-60, PMA 4H, re-excision	HL-60 Cells, PMA stimulated 4H	Blood	Cell Line		Uni-ZAP XR
H0560	KMH2	KMH2				pCMV Sport 3.0
H0561	L428	L428				pCMV Sport 3.0

H0562	Human Fetal Brain, normalized c5-11-26	Human Fetal Brain				pCMV Sport 2.0
H0563	Human Fetal Brain, normalized 50021F	Human Fetal Brain				pCMV Sport 2.0
H0564	Human Fetal Brain, normalized C5001F	Human Fetal Brain				pCMV Sport 2.0
H0566	Human Fetal Brain, normalized c50F	Human Fetal Brain				pCMV Sport 2.0
H0567	Human Fetal Brain, normalized A5002F	Human Fetal Brain				pCMV Sport 2.0
H0569	Human Fetal Brain, normalized CO	Human Fetal Brain				pCMV Sport 2.0
H0570	Human Fetal Brain, normalized C500H	Human Fetal Brain				pCMV Sport 2.0
H0571	Human Fetal Brain, normalized C500HE	Human Fetal Brain				pCMV Sport 2.0
H0572	Human Fetal Brain, normalized AC5002	Human Fetal Brain				pCMV Sport 2.0
H0574	Hepatocellular Tumor; re-excision	Hepatocellular Tumor	Liver		disease	Lambda ZAP II
H0575	Human Adult Pulmonary; re-excision	Human Adult Pulmonary	Lung			Uni-ZAP XR
H0576	Resting T-Cell; re-excision	T-Cells	Blood	Cell Line		Lambda ZAP II
H0579	Pericardium	Pericardium	Heart			pSport1
H0580	Dendritic cells, pooled	Pooled dendritic cells				pCMV Sport 3.0
H0581	Human Bone Marrow, treated	Human Bone Marrow	Bone Marrow			pCMV Sport 3.0
H0583	B Cell lymphoma	B Cell Lymphoma	B Cell		disease	pCMV Sport 3.0
H0584	Activated T-cells, 24 hrs, re-excision	Activated T-Cells	Blood	Cell Line		Uni-ZAP XR
H0585	Activated T-Cells, 12 hrs, re-excision	Activated T-Cells	Blood	Cell Line		Uni-ZAP XR

H0586	Healing groin wound, 6.5 hours post incision	healing groin wound, 6.5 hours post incision - 2/	groin		disease	pCMV Sport 3.0
H0587	Healing groin wound; 7.5 hours post incision	Groin-2/19/97	groin		disease	pCMV Sport 3.0
H0589	CD34 positive cells (cord blood); re-ex	CD34 Positive Cells	Cord Blood			ZAP Express
H0590	Human adult small intestine; re-excision	Human Adult Small Intestine	Small Int.			Uni-ZAP XR
H0591	Human T-cell lymphoma; re-excision	T-Cell Lymphoma	T-Cell		disease	Uni-ZAP XR
H0592	Healing groin wound - zero hr post-incision (control)	HGS wound healing project; abdomen			disease	pCMV Sport 3.0
H0593	Olfactory epithelium; nasal cavity	Olfactory epithelium from roof of left nasal cavity				pCMV Sport 3.0
H0594	Human Lung Cancer; re-excision	Human Lung Cancer	Lung		disease	Lambda ZAP II
H0595	Stomach cancer (human); re-excision	Stomach Cancer - 5383A (human)			disease	Uni-ZAP XR
H0596	Human Colon Cancer; re-excision	Human Colon Cancer	Colon			Lambda ZAP II
H0597	Human Colon; re-excision	Human Colon				Lambda ZAP II
H0598	Human Stomach; re-excision	Human Stomach	Stomach			Uni-ZAP XR
H0599	Human Adult Heart; re-excision	Human Adult Heart	Heart			Uni-ZAP XR
H0600	Healing Abdomen wound; 70&90 min post incision	Abdomen			disease	pCMV Sport 3.0
H0601	Healing Abdomen Wound; 15 days post incision	Abdomen			disease	pCMV Sport 3.0
H0602	Healing Abdomen	Abdomen			disease	pCMV Sport 3.0

	Wound:21&29 days post incision						
H0604	Human Pituitary, re-excision	Human Pituitary					pBluescript
H0606	Human Primary Breast Cancer;re-excision	Human Primary Breast Cancer	Breast			disease	Uni-ZAP XR
H0607	H.Leukocytes, normalized cot 50A3	H.Leukocytes					pCMVSPORT 1
H0609	H. Leukocytes, normalized cot > 500A	H.Leukocytes					pCMVSPORT 1
H0610	H. Leukocytes, normalized cot 5A	H.Leukocytes					pCMVSPORT 1
H0611	H. Leukocytes, normalized cot 500 B	H.Leukocytes					pCMVSPORT 1
H0613	H.Leukocytes, normalized cot 5B	H.Leukocytes					pCMVSPORT 1
H0614	H. Leukocytes, normalized cot 500 A	H. Leukocytes					Uni-ZAP XR
H0615	Human Ovarian Cancer Reexcision	Ovarian Cancer	Ovary			disease	Uni-ZAP XR
H0616	Human Testes, Reexcision	Human Testes	Testis				Uni-ZAP XR
H0617	Human Primary Breast Cancer Reexcision	Human Primary Breast Cancer	Breast			disease	Uni-ZAP XR
H0618	Human Adult Testes, Large Inserts, Reexcision	Human Adult Testis	Testis				Uni-ZAP XR
H0619	Fetal Heart	Human Fetal Heart	Heart				Uni-ZAP XR
H0620	Human Fetal Kidney; Reexcision	Human Fetal Kidney	Kidney				Uni-ZAP XR
H0622	Human Pancreas Tumor; Reexcision	Human Pancreas Tumor	Pancreas			disease	Uni-ZAP XR
H0623	Human Umbilical Vein; Reexcision	Human Umbilical Vein Endothelial Cells	Umbilical vein				Uni-ZAP XR
H0624	12 Week Early Stage	Twelve Week Old Early	Embryo				Uni-ZAP XR

	Human II; Reexcision	Stage Human				
H0625	Ku 812F Basophils Line	Ku 812F Basophils				pSport1
H0626	Saos2 Cells; Untreated	Saos2 Cell Line; Untreated				pSport1
H0627	Saos2 Cells; Vitamin D3 Treated	Saos2 Cell Line; Vitamin D3 Treated				pSport1
H0628	Human Pre-Differentiated Adipocytes	Human Pre-Differentiated Adipocytes				Uni-ZAP XR
H0629	Human Leukocyte, control #2	Human Normalized leukocyte				pCMVSPORT 1
H0631	Saos2, Dexamethosone Treated	Saos2 Cell Line; Dexamethosone Treated				pSport1
H0632	Hepatocellular Tumor; re-excision	Hepatocellular Tumor	Liver			Lambda ZAP II
H0633	Lung Carcinoma A549	TNFalpha activated A549-- Lung Carcinoma			disease	pSport1
H0634	Human Testes Tumor, re-excision	Human Testes Tumor	Testis		disease	Uni-ZAP XR
H0635	Human Activated T-Cells, re-excision	Activated T-Cells	Blood	Cell Line		Uni-ZAP XR
H0637	Dendritic Cells From CD34 Cells	Dendritic cells from CD34 cells				pSport1
H0638	CD40 activated monocyte dendritic cells	CD40 activated monocyte dendritic cells				pSport1
H0640	Ficollod Human Stromal Cells, Untreated	Ficollod Human Stromal Cells, Untreated				Other
H0641	LPS activated derived dendritic cells	LPS activated monocyte derived dendritic cells				pSport1
H0642	Hep G2 Cells, lambda library	Hep G2 Cells				Other
H0643	Hep G2 Cells, PCR library	Hep G2 Cells				Other
H0644	Human Placenta (re-excision)	Human Placenta	Placenta			Uni-ZAP XR
H0645	Fetal Heart, re-excision	Human Fetal Heart	Heart			Uni-ZAP XR

H0646	Lung, Cancer (4005313 A3): Invasive Poorly Differentiated Lung Adenocarcinoma.	Metastatic squamous cell lung carcinoma, poorly di				pSport1
H0647	Lung, Cancer (4005163 B7): Invasive, Poorly Diff. Adenocarcinoma, Metastatic	Invasive poorly differentiated lung adenocarcinoma			disease	pSport1
H0648	Ovary, Cancer: (4004562 B6) Papillary Serous Cystic Neoplasm, Low Malignant Pot	Papillary Cstic neoplasm of low malignant potentia			disease	pSport1
H0649	Lung, Normal: (4005313 B1)	Normal Lung				pSport1
H0650	B-Cells	B-Cells				pCMV Sport 3.0
H0651	Ovary, Normal: (9805C040R)	Normal Ovary				pSport1
H0652	Lung, Normal: (4005313 B1)	Normal Lung				pSport1
H0653	Stromal Cells	Stromal Cells				pSport1
H0654	Lung, Cancer: (4005313 A3) Invasive Poorly-differentiated Metastatic lung adenoc.	Metastatic Squamous cell lung Carcinoma poorly dif				Other
H0656	B-cells (unstimulated)	B-cells (unstimulated)				pSport1
H0657	B-cells (stimulated)	B-cells (stimulated)				pSport1
H0658	Ovary, Cancer (9809C332): Poorly differentiated adenocarcinoma	9809C332-Poorly differentiate	Ovary & Fallopian Tubes		disease	pSport1
H0659	Ovary, Cancer (15395A1F): Grade II Papillary Carcinoma	Grade II Papillary Carcinoma, Ovary	Ovary		disease	pSport1

H0660	Ovary, Cancer: (15799A1F) Poorly differentiated carcinoma	Poorly differentiated carcinoma, ovary				
H0661	Breast, Cancer: (4004943 A5)	Breast cancer				pSport1
H0662	Breast, Normal: (4005522B2)	Normal Breast - #4005522(B2)	Breast			pSport1
H0663	Breast, Cancer: (4005522 A2)	Breast Cancer - #4005522(A2)	Breast			pSport1
H0664	Breast, Cancer: (9806C012R)	Breast Cancer	Breast			pSport1
H0665	Stromal cells 3.88	Stromal cells 3.88				pSport1
H0666	Ovary, Cancer: (4004332 A2)	Ovarian Cancer, Sample #4004332A2				pSport1
H0667	Stromal cells(HBM3.18)	Stromal cell(HBM 3.18)				pSport1
H0668	stromal cell clone 2.5	stromal cell clone 2.5				pSport1
H0670	Ovary, Cancer(4004650 A3): Well-Differentiated Micropapillary Serous Carcinoma	Ovarian Cancer - 4004650A3				pSport1
H0671	Breast, Cancer: (9802C02OE)	Breast Cancer- Sample # 9802C02OE				pSport1
H0672	Ovary, Cancer: (4004576 A8)	Ovarian Cancer(4004576A8)	Ovary			pSport1
H0673	Human Prostate Cancer, Stage B2; re-excision	Human Prostate Cancer, stage B2	Prostate			Uni-ZAP XR
H0674	Human Prostate Cancer, Stage C; re-excision	Human Prostate Cancer, stage C	Prostate			Uni-ZAP XR
H0675	Colon, Cancer: (9808C064R)	Colon Cancer 9808C064R				pCMVSPORT 3.0
H0676	Colon, Cancer: (9808C064R)-total RNA	Colon Cancer 9808C064R				pCMVSPORT 3.0
H0677	TNFR degenerate oligo	B-Cells				PCR II

H0678	screened clones from placental library	Placenta	Placenta	Other
H0682	Serous Papillary Adenocarcinoma	serous papillary adenocarcinoma (9606G304SPA3B)		pCMV Sport 3.0
H0683	Ovarian Serous Papillary Adenocarcinoma	Serous papillary adenocarcinoma, stage 3C (9804G01)		pCMV Sport 3.0
H0684	Serous Papillary Adenocarcinoma	Ovarian Cancer-9810G606	Ovaries	pCMV Sport 3.0
H0685	Adenocarcinoma of Ovary, Human Cell Line, # OVCAR-3	Adenocarcinoma of Ovary, Human Cell Line, # OVCAR-		pCMV Sport 3.0
H0686	Adenocarcinoma of Ovary, Human Cell Line	Adenocarcinoma of Ovary, Human Cell Line, # SW-626		pCMV Sport 3.0
H0687	Human normal ovary (#9610G215)	Human normal ovary (#9610G215)	Ovary	pCMV Sport 3.0
H0688	Human Ovarian Cancer (#9807G017)	Human Ovarian cancer (#9807G017), mRNA from Maura Ru		pCMV Sport 3.0
H0689	Ovarian Cancer	Ovarian Cancer, #9806G019		pCMV Sport 3.0
H0690	Ovarian Cancer, # 9702G001	Ovarian Cancer, #9702G001		pCMV Sport 3.0
H0691	Normal Ovary, #9710G208	normal ovary, #9710G208		pCMV Sport 3.0
H0693	Normal Prostate #ODQ3958EN	Normal Prostate Tissue # ODQ3958EN		pCMV Sport 3.0
H0694	Prostate gland adenocarcinoma	Prostate gland, adenocarcinoma, mod/diff, gleason	prostate gland	pCMV Sport 3.0
H0695	mononucleocytes from patient	mononucleocytes from patient at Shady Grove Hospit		pCMV Sport 3.0



N0003	Human Fetal Brain	Human Fetal Brain					
N0006	Human Fetal Brain	Human Fetal Brain					
N0007	Human Hippocampus	Human Hippocampus					
N0009	Human Hippocampus, prescreened	Human Hippocampus					
S0001	Brain frontal cortex	Brain frontal cortex	Brain				Lambda ZAP II
S0002	Monocyte activated	Monocyte-activated	blood		Cell Line		Uni-ZAP XR
S0003	Human Osteoclastoma	Osteoclastoma	bone			disease	Uni-ZAP XR
S0004	Prostate	Prostate BPH	Prostate				Lambda ZAP II
S0006	Neuroblastoma	Human Neural Blastoma				disease	pCDNA
S0007	Early Stage Human Brain	Human Fetal Brain					Uni-ZAP XR
S0010	Human Amygdala	Amygdala					Uni-ZAP XR
S0011	STROMAL - OSTEOCLASTOMA	Osteoclastoma	bone			disease	Uni-ZAP XR
S0013	Prostate	Prostate	prostate				Uni-ZAP XR
S0014	Kidney Cortex	Kidney cortex	Kidney				Uni-ZAP XR
S0015	Kidney medulla	Kidney medulla	Kidney				Uni-ZAP XR
S0016	Kidney Pyramids	Kidney pyramids	Kidney				Uni-ZAP XR
S0021	Whole brain	Whole brain	Brain				ZAP Express
S0022	Human Osteoclastoma Stromal Cells - unamplified	Osteoclastoma Stromal Cells					Uni-ZAP XR
S0023	Human Kidney Cortex - unamplified	Human Kidney Cortex					
S0024	Human Kidney Medulla - unamplified	Human Kidney Medulla					
S0026	Stromal cell TF274	stromal cell	Bone marrow		Cell Line		Uni-ZAP XR
S0027	Smooth muscle, serum treated	Smooth muscle	Pulmonary artery		Cell Line		Uni-ZAP XR
S0028	Smooth muscle, control	Smooth muscle	Pulmonary artery		Cell Line		Uni-ZAP XR
S0029	brain stem	Brain stem	brain				Uni-ZAP XR

S0030	Brain pons	Brain Pons	Brain			Uni-ZAP XR
S0031	Spinal cord	Spinal cord	spinal cord			Uni-ZAP XR
S0032	Smooth muscle-ILb induced	Smooth muscle	Pulmonary artery	Cell Line		Uni-ZAP XR
S0035	Brain medulla oblongata	Brain medulla oblongata	Brain			Uni-ZAP XR
S0036	Human Substantia Nigra	Human Substantia Nigra				Uni-ZAP XR
S0037	Smooth muscle, IL1b induced	Smooth muscle	Pulmonary artery	Cell Line		Uni-ZAP XR
S0038	Human Whole Brain #2 - Oligo dT > 1.5Kb	Human Whole Brain #2				ZAP Express
S0039	Hypothalamus	Hypothalamus	Brain			Uni-ZAP XR
S0040	Adipocytes	Human Adipocytes from Osteoclastoma				Uni-ZAP XR
S0042	Testes	Human Testes				ZAP Express
S0044	Prostate BPH	prostate BPH	Prostate		disease	Uni-ZAP XR
S0045	Endothelial cells-control	Endothelial cell	endothelial cell-lung	Cell Line		Uni-ZAP XR
S0046	Endothelial-induced	Endothelial cell	endothelial cell-lung	Cell Line		Uni-ZAP XR
S0048	Human Hypothalamus, Alzheimer's	Human Hypothalamus, Alzheimer's			disease	Uni-ZAP XR
S0049	Human Brain, Striatum	Human Brain, Striatum				Uni-ZAP XR
S0050	Human Frontal Cortex, Schizophrenia	Human Frontal Cortex, Schizophrenia			disease	Uni-ZAP XR
S0051	Human Hypothalamus, Schizophrenia	Human Hypothalamus, Schizophrenia			disease	Uni-ZAP XR
S0052	neutrophils control	human neutrophils	blood	Cell Line		Uni-ZAP XR
S0053	Neutrophils IL-1 and LPS induced	human neutrophil induced	blood	Cell Line		Uni-ZAP XR
S0106	STRIATUM DEPRESSION		BRAIN		disease	Uni-ZAP XR
S0110	Brain Amygdala		Brain		disease	Uni-ZAP XR

	Depression					
S0112	Hypothalamus		Brain			Uni-ZAP XR
S0114	Anergic T-cell	Anergic T-cell		Cell Line		Uni-ZAP XR
S0116	Bone marrow	Bone marrow	Bone marrow			Uni-ZAP XR
S0122	Osteoclastoma-normalized A	Osteoclastoma	bone		disease	pBluescript
S0124	Smooth muscle-edited A	Smooth muscle	Pulmonary artery	Cell Line		Uni-ZAP XR
S0126	Osteoblasts	Osteoblasts	Knee	Cell Line		Uni-ZAP XR
S0132	Epithelial-TNF $\alpha$ and INF induced	Airway Epithelial				Uni-ZAP XR
S0134	Apoptotic T-cell	apoptotic cells		Cell Line		Uni-ZAP XR
S0136	PERM TF274	stromal cell	Bone marrow	Cell Line		Lambda ZAP II
S0140	eosinophil-IL5 induced	eosinophil	lung	Cell Line		Uni-ZAP XR
S0142	Macrophage-oxLDL	macrophage-oxidized LDL treated	blood	Cell Line		Uni-ZAP XR
S0144	Macrophage (GM-CSF treated)	Macrophage (GM-CSF treated)				Uni-ZAP XR
S0146	prostate-edited	prostate BPH	Prostate			Uni-ZAP XR
S0148	Normal Prostate	Prostate	prostate			Uni-ZAP XR
S0150	LNCAP prostate cell line	LNCAP Cell Line	Prostate	Cell Line		Uni-ZAP XR
S0152	PC3 Prostate cell line	PC3 prostate cell line				Uni-ZAP XR
S0168	Prostate/LNCAP, subtraction I	PC3 prostate cell line				pBluescript
S0176	Prostate, normal, subtraction I	Prostate	prostate			Uni-ZAP XR
S0180	Bone Marrow Stroma, TNF&LPS ind	Bone Marrow Stroma, TNF & LPS induced			disease	Uni-ZAP XR
S0182	Human B Cell 8866	Human B- Cell 8866				Uni-ZAP XR
S0188	Prostate,BPH, Lib 2	Human Prostate BPH			disease	pSport1
S0190	Prostate BPH,Lib 2,	Human Prostate BPH				pSport1

	subtracted						
S0192	Synovial Fibroblasts (control)	Synovial Fibroblasts					pSport1
S0194	Synovial hypoxia	Synovial Fibroblasts					pSport1
S0196	Synovial IL-1/TNF stimulated	Synovial Fibroblasts					pSport1
S0206	Smooth Muscle- HASTE normalized	Smooth muscle	Pulmonary artery	Cell Line			pBluescript
S0208	Mesangial cell, frac 1	Mesangial cell					pSport1
S0210	Mesangial cell, frac 2	Mesangial cell					pSport1
S0212	Bone Marrow Stromal Cell, untreated	Bone Marrow Stromal Cell, untreated					pSport1
S0214	Human Osteoclastoma, re-excision	Osteoclastoma	bone		disease		Uni-ZAP XR
S0216	Neutrophils IL-1 and LPS induced	human neutrophil induced	blood	Cell Line			Uni-ZAP XR
S0218	Apoptotic T-cell, re-excision	apoptotic cells		Cell Line			Uni-ZAP XR
S0220	H. hypothalamus, frac A; re-excision	Hypothalamus	Brain				ZAP Express
S0222	H. Frontal cortex, epileptic; re-excision	H. Brain, Frontal Cortex, Epileptic	Brain		disease		Uni-ZAP XR
S0242	Synovial Fibroblasts (IL1/TNF), subt	Synovial Fibroblasts					pSport1
S0250	Human Osteoblasts II	Human Osteoblasts	Femur		disease		pCMVSPORT 2.0
S0260	Spinal Cord, re-excision	Spinal cord	spinal cord				Uni-ZAP XR
S0276	Synovial hypoxia-RSF subtracted	Synovial fibroblasts (rheumatoid)	Synovial tissue				pSport1
S0278	H Macrophage (GM-CSF treated), re-excision	Macrophage (GM-CSF treated)					Uni-ZAP XR
S0280	Human Adipose Tissue, re-excision	Human Adipose Tissue					Uni-ZAP XR

S0282	Brain Frontal Cortex, re-excision	Brain frontal cortex	Brain			Lambda ZAP II
S0292	Osteoarthritis (OA-4)	Human Osteoarthritic Cartilage	Bone	disease		pSport1
S0294	Larynx tumor	Larynx tumor	Larynx, vocal cord	disease		pSport1
S0298	Bone marrow stroma, treated	Bone marrow stroma, treated SB	Bone marrow			pSport1
S0300	Frontal lobe, dementia, re-excision	Frontal Lobe dementia/Alzheimer's	Brain			Uni-ZAP XR
S0306	Larynx normal #10 261-273	Larynx normal				pSport1
S0308	Spleen/normal	Spleen normal				pSport1
S0310	Normal trachea	Normal trachea				pSport1
S0312	Human osteoarthritic; fraction II	Human osteoarthritic cartilage		disease		pSport1
S0314	Human osteoarthritic; fraction I	Human osteoarthritic cartilage		disease		pSport1
S0316	Human Normal Cartilage, Fraction I	Human Normal Cartilage				pSport1
S0318	Human Normal Cartilage, Fraction II	Human Normal Cartilage				pSport1
S0328	Palate carcinoma	Palate carcinoma	Uvula	disease		pSport1
S0330	Palate normal	Palate normal	Uvula			pSport1
S0332	Pharynx carcinoma	Pharynx carcinoma	Hypopharynx			pSport1
S0334	Human Normal Cartilage, Fraction III	Human Normal Cartilage				pSport1
S0336	Human Normal Cartilage, Fraction IV	Human Normal Cartilage				pSport1
S0338	Human Osteoarthritic Cartilage, Fraction III	Human osteoarthritic cartilage		disease		pSport1
S0340	Human Osteoarthritic	Human osteoarthritic		disease		pSport1

	Cartilage Fraction IV	cartilage				Uni-ZAP XR
S0342	Adipocytes;re-excision	Human Adipocytes from Osteoclastoma				Uni-ZAP XR
S0344	Macrophage-oxLDL; re-excision	macrophage-oxidized LDL treated	blood	Cell Line		Uni-ZAP XR
S0346	Human Amygdala;re-excision	Amygdala				Uni-ZAP XR
S0348	Cheek Carcinoma	Cheek Carcinoma			disease	pSportl
S0350	Pharynx Carcinoma	Pharynx carcinoma	Hypopharynx		disease	pSportl
S0352	Larynx Carcinoma	Larynx carcinoma			disease	pSportl
S0354	Colon Normal II	Colon Normal	Colon			pSportl
S0356	Colon Carcinoma	Colon Carcinoma	Colon		disease	pSportl
S0358	Colon Normal III	Colon Normal	Colon			pSportl
S0360	Colon Tumor II	Colon Tumor	Colon		disease	pSportl
S0362	Human Gastrocnemius	Gastrocnemius muscle				pSportl
S0364	Human Quadriceps	Quadriceps muscle				pSportl
S0366	Human Soleus	Soleus Muscle				pSportl
S0368	Human Pancreatic Langerhans	Islets of Langerhans				pSportl
S0370	Larynx carcinoma II	Larynx carcinoma			disease	pSportl
S0372	Larynx carcinoma III	Larynx carcinoma			disease	pSportl
S0374	Normal colon	Normal colon				pSportl
S0376	Colon Tumor	Colon Tumor			disease	pSportl
S0378	Pancreas normal PCA4 No	Pancreas Normal PCA4 No				pSportl
S0380	Pancreas Tumor PCA4 Tu	Pancreas Tumor PCA4 Tu			disease	pSportl
S0382	Larynx carcinoma IV	Larynx carcinoma			disease	pSportl
S0384	Tongue carcinoma	Tongue carcinoma			disease	pSportl
S0386	Human Whole Brain, re-excision	Whole brain	Brain			ZAP Express
S0388	Human Hypothalamus, schizophrenia	Human Hypothalamus, Schizophrenia			disease	Uni-ZAP XR

	nia, re-excision	Smooth muscle, control; re-excision	Smooth muscle	Pulmonary artery	Cell Line		Uni-ZAP XR
S0390	Salivary Gland	Salivary gland; normal					pSport1
S0392	Stomach; normal	Stomach; normal					pSport1
S0394	Testis; normal	Testis; normal					pSport1
S0398	Brain; normal	Brain; normal					pSport1
S0400	Adrenal Gland; normal	Adrenal gland; normal					pSport1
S0402	Rectum normal	Rectum, normal					pSport1
S0404	Rectum tumour	Rectum tumour					pSport1
S0406	Colon, normal	Colon, normal					pSport1
S0408	Colon, tumour	Colon, tumour					pSport1
S0410	Temporal cortex - Alzheimer; subtracted	Temporal cortex, alzheimer				disease	Other
S0412	Hippocampus, Alzheimer Subtracted	Hippocampus, Alzheimer Subtracted					Other
S0414	CHME Cell Line; treated 5 hrs	CHME Cell Line; treated					pCMV Sport 3.0
S0418	CHME Cell Line, untreated	CHME Cell line, untreated					pSport1
S0420	Mo7e Cell Line GM-CSF treated (1ng/ml)	Mo7e Cell Line GM-CSF treated (1ng/ml)					pCMV Sport 3.0
S0422	TF-1 Cell Line GM-CSF Treated	TF-1 Cell Line GM-CSF Treated					pSport1
S0424	Monocyte activated; re- excision	Monocyte-activated		blood	Cell Line		Uni-ZAP XR
S0426	Neutrophils control; re- excision	human neutrophils		blood	Cell Line		Uni-ZAP XR
S0428	Aryepiglottis Normal	Aryepiglottis Normal					pSport1
S0430	Sinus piniformis Tumour	Sinus piniformis Tumour					pSport1
S0432	Stomach Normal	Stomach Normal				disease	pSport1
S0434	Stomach Tumour	Stomach Tumour				disease	pSport1
S0436	Liver Normal Met5No	Liver Normal Met5No					pSport1
S0438							

S0440	Liver Tumour Met 5 Tu	Liver Tumour				pSportl
S0442	Colon Normal	Colon Normal				pSportl
S0444	Colon Tumor	Colon Tumor			disease	pSportl
S0446	Tongue Tumour	Tongue Tumour				pSportl
S0448	Larynx Normal	Larynx Normal				pSportl
S0450	Larynx Tumour	Larynx Tumour				pSportl
S0452	Thymus	Thymus				pSportl
S0454	Placenta	Placenta				pSportl
S0456	Tongue Normal	Tongue Normal				pSportl
S0458	Thyroid Normal (SDCA2 No)	Thyroid normal				pSportl
S0460	Thyroid Tumour	Thyroid Tumour				pSportl
S0462	Thyroid Thyroiditis	Thyroid Thyroiditis				pSportl
S0464	Larynx Normal	Larynx Normal				pSportl
S0466	Larynx Tumor	Larynx Tumor			disease	pSportl
S0468	Ea.hy.926 cell line	Ea.hy.926 cell line			disease	pSportl
S0470	Adenocarcinoma	PYFD				pSportl
S0472	Lung Mesothelium	PYBT				pSportl
S0474	Human blood platelets	Platelets		Blood platelets		Other
S0665	Human Amygdala; re-excision	Amygdala				Uni-ZAP XR
S3012	Smooth Muscle Serum Treated, Norm	Smooth muscle		Pulmonary artery	Cell Line	pBluescript
S3014	Smooth muscle, serum induced, re-exc	Smooth muscle		Pulmonary artery	Cell Line	pBluescript
S6014	H. hypothalamus, frac A	Hypothalamus		Brain		ZAP Express
S6016	H. Frontal Cortex, Epileptic	H. Brain, Frontal Cortex, Epileptic		Brain	disease	Uni-ZAP XR
S6022	H. Adipose Tissue	Human Adipose Tissue				Uni-ZAP XR
S6024	Alzheimers, spongy change	Alzheimer's/Spongy change		Brain	disease	Uni-ZAP XR



S6026	Frontal Lobe, Dementia	Frontal Lobe demential/Alzheimer's	Brain			Uni-ZAP XR
S6028	Human Manic Depression Tissue	Human Manic depression tissue	Brain	disease		Uni-ZAP XR
T0002	Activated T-cells	Activated T-Cell, PBL fraction	Blood	Cell Line		pBluescript SK-
T0003	Human Fetal Lung	Human Fetal Lung				pBluescript SK-
T0004	Human White Fat	Human White Fat				pBluescript SK-
T0006	Human Pineal Gland	Human Pineal Gland				pBluescript SK-
T0008	Colorectal Tumor	Colorectal Tumor		disease		pBluescript SK-
T0010	Human Infant Brain	Human Infant Brain				Other
T0023	Human Pancreatic Carcinoma	Human Pancreatic Carcinoma		disease		pBluescript SK-
T0039	HSA 172 Cells	Human HSA172 cell line				pBluescript SK-
T0040	HSC172 cells	SA172 Cells				pBluescript SK-
T0041	Jurkat T-cell G1 phase	Jurkat T-cell				pBluescript SK-
T0042	Jurkat T-Cell, S phase	Jurkat T-Cell Line				pBluescript SK-
T0048	Human Aortic Endothelium	Human Aortic Endothelium				pBluescript SK-
T0049	Aorta endothelial cells + TNF-a	Aorta endothelial cells				pBluescript SK-
T0060	Human White Adipose	Human White Fat				pBluescript SK-
T0067	Human Thyroid	Human Thyroid				pBluescript SK-
T0068	Normal Ovary, Premenopausal	Normal Ovary, Premenopausal				pBluescript SK-
T0069	Human Uterus, normal	Human Uterus, normal				pBluescript SK-
T0071	Human Bone Marrow	Human Bone Marrow				pBluescript SK-
T0079	Human Kidney, normal Adult	Human Kidney, normal Adult				pBluescript SK-
T0082	Human Adult Retina	Human Adult Retina				pBluescript SK-
T0086	Human Pancreatic Carcinoma -- Screened	Human Pancreatic Carcinoma		disease		pBluescript SK-
T0103	Human colon carcinoma					pBluescript SK-

T0104	(HCC) cell line HCC cell line metastasis to liver						pBluescript SK-
T0109	Human (HCC) cell line liver (mouse) metastasis, remake						pBluescript SK-
T0110	Human colon carcinoma (HCC) cell line, remake						pBluescript SK-
T0112	Human (Caco-2) cell line, adenocarcinoma, colon						pBluescript SK-
T0114	Human (Caco-2) cell line, adenocarcinoma, colon, remake						pBluescript SK-
T0115	Human Colon Carcinoma (HCC) cell line						pBluescript SK-
L0002	Atrium cDNA library						
L0005	Human heart						
L0015	Clontech human aorta polyA+ mRNA (#6572)						
L0021	Human						
L0022	Human adult (K.Okubo)						
L0024	Human adult lung 3" directed Mbol cDNA						
L0040	Human brain ARSanders						
L0041	Human colon mucosa						
L0045	Human epidermal keratinocyte						
L0053	Human keratinocyte differential display (B.Lin)						
L0055	Human pancreatic tumor						
L0065	Human promyelocyte						
L0070	Liver HepG2 cell line.						
	Selected chromosome 21						

	cDNA library					
L0096	Subtracted human retina					
L0097	Subtracted human retinal pigment epithelium (RPE)					
L0103	DKFZphamy1	amygdala				
L0105	Human aorta polyA+ (TFujiwara)	aorta				
L0142	Human placenta cDNA (TFujiwara)	placenta				
L0143	Human placenta polyA+ (TFujiwara)	placenta				
L0151	Human testis (C. De Smet)	testis				
L0157	Human fetal brain (TFujiwara)		brain			
L0163	Human heart cDNA (YNakamura)		heart			
L0182	Human HeLa (Y.Wang)			HeLa		
L0187	Human fibrosarcoma cell line HT1080	fibrosarcoma		HT1080		
L0194	Human pancreatic cancer cell line Patu 8988t	pancreatic cancer		Patu 8988t		
L0295	Human liver EST (Y.L. Yu)		liver			
L0309	Human E8CASS	breast adenocarcinoma		E8CASS; variant of MCF7		
L0351	Infant brain, Bento Soares					BA, M13-derived
L0352	Normalized infant brain, Bento Soares					BA, M13-derived
L0355	P, Human foetal Brain					Bluescript
L0356	Whole tissue S, Human foetal Adrenals tissue					Bluescript

L0361	Stratagene ovary (#937217)					Bluescript SK
L0362	Stratagene ovarian cancer (#937219)					Bluescript SK-
L0363	NCL_CGAP_GC2	germ cell tumor				Bluescript SK-
L0364	NCL_CGAP_GC5	germ cell tumor				Bluescript SK-
L0365	NCL_CGAP_Phe1	pheochromocytoma				Bluescript SK-
L0366	Stratagene schizo brain S11	schizophrenic brain S-11 frontal lobe				Bluescript SK-
L0367	NCL_CGAP_Sch1	Schwannoma tumor				Bluescript SK-
L0368	NCL_CGAP_SS1	synovial sarcoma				Bluescript SK-
L0369	NCL_CGAP_AA1	adrenal adenoma			adrenal gland	Bluescript SK-
L0370	Johnston frontal cortex	pooled frontal lobe			brain	Bluescript SK-
L0371	NCL_CGAP_Br3	breast tumor			breast	Bluescript SK-
L0372	NCL_CGAP_Co12	colon tumor			colon	Bluescript SK-
L0373	NCL_CGAP_Co11	tumor			colon	Bluescript SK-
L0374	NCL_CGAP_Co2	tumor			colon	Bluescript SK-
L0375	NCL_CGAP_Kid6	kidney tumor			kidney	Bluescript SK-
L0376	NCL_CGAP_Lar1	larynx			larynx	Bluescript SK-
L0378	NCL_CGAP_Lu1	lung tumor			lung	Bluescript SK-
L0379	NCL_CGAP_Lym3	lymphoma			lymph node	Bluescript SK-
L0381	NCL_CGAP_HN4	squamous cell carcinoma			pharynx	Bluescript SK-
L0382	NCL_CGAP_Pr25	epithelium (cell line)			prostate	Bluescript SK-
L0383	NCL_CGAP_Pr24	invasive tumor (cell line)			prostate	Bluescript SK-
L0384	NCL_CGAP_Pr23	prostate tumor			prostate	Bluescript SK-
L0385	NCL_CGAP_Gas1	gastric tumor			stomach	Bluescript SK-
L0386	NCL_CGAP_HN3	squamous cell carcinoma from base of tongue			tongue	Bluescript SK-
L0387	NCL_CGAP_GCB0	germinal center B-cells			tonsil	Bluescript SK-
L0388	NCL_CGAP_HN6	normal gingiva (cell line)				Bluescript SK-

L0389	NCL CGAP_HNS	from immortalized kerati normal gingiva (cell line from primary keratinocyt				Bluescript SK-
L0394	H. Human adult Brain Cortex tissue					gt11
L0404	b4HB3MA Cot109+103+85-Bio					Lafmid A
L0411	1-NIB					Lafmid BA
L0415	b4HB3MA Cot8-HAP-Ft					Lafmid BA
L0418	b4HB3MA-Cot109+10- Bio					Lafmid BA
L0428	Cot1374Ft-4HB3MA					Lafmid BA
L0434	Infant brain library of Dr. M. Soares					lafmid BA
L0435	Infant brain, LLNL array of Dr. M. Soares 1NIB					lafmid BA
L0438	normalized infant brain cDNA	total brain	brain			lafmid BA
L0439	Soares infant brain 1NIB		whole brain			Lafmid BA
L0443	b4HB3MK					Lafmid BK
L0446	N4HB3MK					Lafmid BK
L0454	Clontech adult human fat cell library HL1108A					lambda gt10
L0455	Human retina cDNA randomly primed sublibrary	retina	eye			lambda gt10
L0456	Human retina cDNA Tsp509I-cleaved sublibrary	retina	eye			lambda gt10
L0457	multi-tissue normalized short-fragment	multi-tissue	pooled			lambda gt10
L0459	Adult heart, Clontech					Lambda gt11

L0460	Adult heart, Lambda gtl1					Lambda gtl1
L0462	WATM1					lambda gtl1
L0463	fetal brain cDNA	brain			brain	lambda gtl1
L0465	TEST1, Human adult Testis tissue					lambda nm1149
L0468	HE6W					lambda zap
L0471	Human fetal heart, Lambda ZAP Express					Lambda ZAP Express
L0475	KG1-a Lambda Zap Express cDNA library				KG1-a	Lambda Zap Express (Stratagene)
L0476	Fetal brain, Stratagene					Lambda ZAP II
L0480	Stratagene cat#937212 (1992)					Lambda ZAP, pBluescript SK(-)
L0481	CD34+DIRECTIONAL					Lambda ZAPII
L0483	Human pancreatic islet					Lambda ZAPII
L0485	STRATAGENE Human skeletal muscle cDNA library, cat. #936215.	skeletal muscle			leg muscle	Lambda ZAPII
L0492	Human Genomic					pAMP
L0493	NCL CGAP_Ov26	papillary serous carcinoma			ovary	pAMP1
L0497	NCL CGAP_HSC4	CD34+, CD38- from normal bone marrow donor			bone marrow	pAMP1
L0498	NCL CGAP_HSC3	CD34+, T negative, patient with chronic myelogenous			bone marrow	pAMP1
L0499	NCL CGAP_HSC2	stem cell 34+/38+			bone marrow	pAMP1
L0500	NCL CGAP_Bm20	oligodendroglioma			brain	pAMP1
L0502	NCL CGAP_Br15	adenocarcinoma			breast	pAMP1
L0503	NCL CGAP_Br17	adenocarcinoma			breast	pAMP1
L0504	NCL CGAP_Br13	breast carcinoma in situ			breast	pAMP1
L0505	NCL CGAP_Br12	invasive carcinoma			breast	pAMP1
L0506	NCL CGAP_Br16	lobular carcinoma in situ			breast	pAMP1
L0507	NCL CGAP_Br14	normal epithelium			breast	pAMP1

L0508	NCL CGAP_Lu25	bronchioalveolar carcinoma	lung		pAMP1
L0509	NCL CGAP_Lu26	invasive adenocarcinoma	lung		pAMP1
L0511	NCL CGAP_Ov34	borderline ovarian carcinoma	ovary		pAMP1
L0512	NCL CGAP_Ov36	borderline ovarian carcinoma	ovary		pAMP1
L0513	NCL CGAP_Ov37	early stage papillary serous carcinoma	ovary		pAMP1
L0514	NCL CGAP_Ov31	papillary serous carcinoma	ovary		pAMP1
L0515	NCL CGAP_Ov32	papillary serous carcinoma	ovary		pAMP1
L0517	NCL CGAP_Pr1				pAMP10
L0518	NCL CGAP_Pr2				pAMP10
L0519	NCL CGAP_Pr3				pAMP10
L0520	NCL CGAP_Alv1	alveolar rhabdomyosarcoma			pAMP10
L0521	NCL CGAP_Ew1	Ewing's sarcoma			pAMP10
L0522	NCL CGAP_Kid1	kidney			pAMP10
L0523	NCL CGAP_Lip2	liposarcoma			pAMP10
L0524	NCL CGAP_Li1	liver			pAMP10
L0525	NCL CGAP_Li2	liver			pAMP10
L0526	NCL CGAP_Pr12	metastatic prostate bone lesion			pAMP10
L0527	NCL CGAP_Ov2	ovary			pAMP10
L0528	NCL CGAP_Pr5	prostate			pAMP10
L0529	NCL CGAP_Pr6	prostate			pAMP10
L0530	NCL CGAP_Pr8	prostate			pAMP10
L0532	NCL CGAP_Thy1	thyroid			pAMP10
L0533	NCL CGAP_HSC1	stem cells	bone marrow		pAMP10
L0534	Chromosome 7 Fetal Brain cDNA Library	brain	brain		pAMP10
L0536	NCL CGAP_Br4	normal ductal tissue	breast		pAMP10
L0539	Chromosome 7 Placental		placenta		pAMP10

	cDNA Library						
L0540	NCI_CGAP_Pr10	invasive prostate tumor	prostate				pAMP10
L0542	NCI_CGAP_Pr11	normal prostatic epithelial cells	prostate				pAMP10
L0543	NCI_CGAP_Pr9	normal prostatic epithelial cells	prostate				pAMP10
L0544	NCI_CGAP_Pr4	prostatic intraepithelial neoplasia - high grade	prostate				pAMP10
L0545	NCI_CGAP_Pr4.1	prostatic intraepithelial neoplasia - high grade	prostate				pAMP10
L0546	NCI_CGAP_Pr18	stroma	prostate				pAMP10
L0547	NCI_CGAP_Pr16	tumor	prostate				pAMP10
L0549	NCI_CGAP_HN10	carcinoma in situ from retromolar trigone					pAMP10
L0550	NCI_CGAP_HN9	normal squamous epithelium from retromolar trigone					pAMP10
L0551	NCI_CGAP_HN7	normal squamous epithelium, floor of mouth					pAMP10
L0554	NCI_CGAP_Li8		liver				pAMP10
L0558	NCI_CGAP_Ov40	endometrioid ovarian metastasis	ovary				pAMP10
L0559	NCI_CGAP_Ov39	papillary serous ovarian metastasis	ovary				pAMP10
L0560	NCI_CGAP_HN12	moderate to poorly differentiated invasive carcino	tongue				pAMP10
L0561	NCI_CGAP_HN11	normal squamous epithelium	tongue				pAMP10
L0562	Chromosome 7 HeLa cDNA Library			HeLa cell line; ATCC			pAMP10
L0564	Jia bone marrow stroma						pBluescript
L0565	Normal Human Trabecular Bone Cells	bone marrow stroma Bone	Hip				pBluescript



L0581	Stratagene liver (#937224)					pBluescript SK
L0584	Stratagene cDNA library					pBluescript SK(+)
L0586	Human heart, cat#936208					pBluescript SK(-)
L0587	HTCDL1					pBluescript SK-
L0588	Stratagene colon HT29 (#937221)					pBluescript SK-
L0589	Stratagene endothelial cell 937223					pBluescript SK-
L0590	Stratagene fetal retina 937202					pBluescript SK-
L0591	Stratagene fibroblast (#937212)					pBluescript SK-
L0592	Stratagene HeLa cell s3 937216					pBluescript SK-
L0593	Stratagene hNT neuron (#937233)					pBluescript SK-
L0594	Stratagene neuroepithelium (#937231)					pBluescript SK-
L0595	Stratagene NT2 neuronal precursor 937230					pBluescript SK-
L0596	Stratagene colon (#937204)					pBluescript SK-
L0597	Stratagene corneal stroma (#937222)					pBluescript SK-
L0598	Morton Fetal Cochlea					pBluescript SK-
L0599	Stratagene lung (#937210)					pBluescript SK-
L0600	Weizmann Olfactory Epithelium					pBluescript SK-
L0601	Stratagene pancreas					pBluescript SK-

	(#937208)						
L0602	Pancreatic Islet	pancreatic islet	pancreas				pBluescript SK-
L0603	Stratagene placenta (#937225)		placenta				pBluescript SK-
L0604	Stratagene muscle 937209	muscle	skeletal muscle				pBluescript SK-
L0605	Stratagene fetal spleen (#937205)	fetal spleen	spleen				pBluescript SK-
L0606	NCL_CGAP_Lym5	follicular lymphoma	lymph node				pBluescript SK-
L0607	NCL_CGAP_Lym6	mantle cell lymphoma	lymph node				pBluescript SK-
L0608	Stratagene lung carcinoma 937218	lung carcinoma	lung	NCI-H69			pBluescript SK-
L0609	Schiller astrocytoma	astrocytoma	brain				pBluescript SK- (Stratagene)
L0611	Schiller meningioma	meningioma	brain				pBluescript SK- (Stratagene)
L0612	Schiller oligodendroglioma	oligodendroglioma	brain				pBluescript SK- (Stratagene)
L0615	22 week old human fetal liver cDNA library						pBluescriptII SK(-)
L0616	Chromosome 21 exon						pBluescriptIIKS+
L0617	Chromosome 22 exon						pBluescriptIIKS+
L0619	Chromosome 9 exon II						pBluescriptIIKS+
L0622	HM1						pcDNAII (Invitrogen)
L0623	HM3	pectoral muscle (after mastectomy)					pcDNAII (Invitrogen)
L0625	NCL_CGAP_AR1	bulk alveolar tumor					pCMV-SPORT2
L0626	NCL_CGAP_GC1	bulk germ cell seminoma					pCMV-SPORT2
L0627	NCL_CGAP_Co1	bulk tumor	colon				pCMV-SPORT2
L0628	NCL_CGAP_Ov1	ovary bulk tumor	ovary				pCMV-SPORT2
L0629	NCL_CGAP_Mel3	metastatic melanoma to	bowel (skin				pCMV-SPORT4

L0630	NCL_CGAP_CNS1	bowel	primary)			pCMV-SPORT4
L0631	NCL_CGAP_Br7	substantia nigra	brain			pCMV-SPORT4
L0632	NCL_CGAP_Li5	hepatic adenoma	breast			pCMV-SPORT4
L0634	NCL_CGAP_Ov8	serous adenocarcinoma	liver			pCMV-SPORT4
L0635	NCL_CGAP_PNS1	dorsal root ganglion	ovary			pCMV-SPORT4
			peripheral nervous system			pCMV-SPORT4
L0636	NCL_CGAP_Pit1	four pooled pituitary adenomas	brain			pCMV-SPORT6
L0637	NCL_CGAP_Bm53	three pooled meningiomas	brain			pCMV-SPORT6
L0638	NCL_CGAP_Bm35	tumor, 5 pooled (see description)	brain			pCMV-SPORT6
L0639	NCL_CGAP_Bm52	tumor, 5 pooled (see description)	brain			pCMV-SPORT6
L0640	NCL_CGAP_Br18	four pooled high-grade tumors, including two prima	breast			pCMV-SPORT6
L0641	NCL_CGAP_Co17	juvenile granulosa tumor	colon			pCMV-SPORT6
L0642	NCL_CGAP_Co18	moderately differentiated adenocarcinoma	colon			pCMV-SPORT6
L0643	NCL_CGAP_Co19	moderately differentiated adenocarcinoma	colon			pCMV-SPORT6
L0644	NCL_CGAP_Co20	moderately differentiated adenocarcinoma	colon			pCMV-SPORT6
L0645	NCL_CGAP_Co21	moderately differentiated adenocarcinoma	colon			pCMV-SPORT6
L0646	NCL_CGAP_Co14	moderately-differentiated adenocarcinoma	colon			pCMV-SPORT6
L0647	NCL_CGAP_Sar4	five pooled sarcomas, including myxoid liposarcoma	connective tissue			pCMV-SPORT6
L0648	NCL_CGAP_Eso2	squamous cell carcinoma	esophagus			pCMV-SPORT6
L0649	NCL_CGAP_GUI	2 pooled high-grade	genitourina			pCMV-SPORT6

L0650	NCL_CGAP_Kid13	transitional cell tumors 2 pooled Wilms' tumors, one primary and one metast	ry tract kidney			pCMV-SPORT6
L0651	NCL_CGAP_Kid8	renal cell tumor	kidney			pCMV-SPORT6
L0652	NCL_CGAP_Lu27	four pooled poorly- differentiated adenocarcinomas	lung			pCMV-SPORT6
L0653	NCL_CGAP_Lu28	two pooled squamous cell carcinomas	lung			pCMV-SPORT6
L0654	NCL_CGAP_Lu31		lung, cell line			pCMV-SPORT6
L0655	NCL_CGAP_Lym12	lymphoma, follicular mixed small and large cell	lymph node			pCMV-SPORT6
L0656	NCL_CGAP_Ov38	normal epithelium	ovary			pCMV-SPORT6
L0657	NCL_CGAP_Ov23	tumor, 5 pooled (see description)	ovary			pCMV-SPORT6
L0658	NCL_CGAP_Ov35	tumor, 5 pooled (see description)	ovary			pCMV-SPORT6
L0659	NCL_CGAP_Pan1	adenocarcinoma	pancreas			pCMV-SPORT6
L0661	NCL_CGAP_Mel15	malignant melanoma, metastatic to lymph node	skin			pCMV-SPORT6
L0662	NCL_CGAP_Gas4	poorly differentiated adenocarcinoma with signet r	stomach			pCMV-SPORT6
L0663	NCL_CGAP_Ut2	moderately-differentiated endometrial adenocarcino	uterus			pCMV-SPORT6
L0664	NCL_CGAP_Ut3	poorly-differentiated endometrial adenocarcinoma,	uterus			pCMV-SPORT6
L0665	NCL_CGAP_Ut4	serous papillary carcinoma, high grade, 2 pooled t	uterus			pCMV-SPORT6
L0666	NCL_CGAP_Ut1	well-differentiated endometrial	uterus			pCMV-SPORT6

L0667	NCL_CGAP_CML1	adenocarcinoma, 7 myeloid cells, 18 pooled CML cases, BCR/ABL rearr	whole blood			pcMV-SPORT6
L0683	Stanley Frontal NS pool 2	frontal lobe (see description)	brain			pCR2.1-TOPO (Invitrogen)
L0686	Stanley Frontal SN pool 2	frontal lobe (see description)	brain			pCR2.1-TOPO (Invitrogen)
L0690	Testis, Subtracted					pCRII
L0697	Testis 1					PGEM 5zf(+)
L0698	Testis 2					PGEM 5zf(+)
L0708	NIH_MGC_17	rhabdomyosarcoma	muscle			pOTB7
L0709	NIH_MGC_21	choriocarcinoma	placenta			pOTB7
L0710	NIH_MGC_7	small cell carcinoma	lung	MGC3		pOTB7
L0717	Gessler Wilms tumor					pSPORT1
L0731	Soares_pregnant_uterus_N bHPU		uterus			pT7T3-Pac
L0738	Human colorectal cancer					pT7T3D
L0740	Soares melanocyte 2NbHM	melanocyte				pT7T3D (Pharmacia) with a modified polylinker
L0741	Soares adult brain N2b4HB55Y		brain			pT7T3D (Pharmacia) with a modified polylinker
L0742	Soares adult brain N2b5HB55Y		brain			pT7T3D (Pharmacia) with a modified polylinker
L0743	Soares breast 2NbHBst		breast			pT7T3D (Pharmacia) with a modified polylinker
L0744	Soares breast 3NbHBst		breast			pT7T3D (Pharmacia) with a modified polylinker

L0745	Soares retina N2b4HR	retina	eye			pT7T3D (Pharmacia) with a modified polylinker
L0746	Soares retina N2b5HR	retina	eye			pT7T3D (Pharmacia) with a modified polylinker
L0747	Soares_fetal_heart_NbHH 19W		heart			pT7T3D (Pharmacia) with a modified polylinker
L0748	Soares fetal liver spleen 1NFLS		Liver and Spleen			pT7T3D (Pharmacia) with a modified polylinker
L0749	Soares_fetal_liver_spleen_ 1NFLS_S1		Liver and Spleen			pT7T3D (Pharmacia) with a modified polylinker
L0750	Soares_fetal_lung_NbHL1 9W		lung			pT7T3D (Pharmacia) with a modified polylinker
L0751	Soares ovary tumor NbHOT	ovarian tumor	ovary			pT7T3D (Pharmacia) with a modified polylinker
L0752	Soares_parathyroid_tumor _NbHPA	parathyroid tumor	parathyroid gland			pT7T3D (Pharmacia) with a modified polylinker
L0753	Soares_pineal_gland_N3H PG		pineal gland			pT7T3D (Pharmacia) with a modified polylinker
L0754	Soares placenta Nb2HP		placenta			pT7T3D (Pharmacia) with a modified polylinker
L0755	Soares_placenta_8to9wee ks_2NbHP8to9W		placenta			pT7T3D (Pharmacia) with a modified polylinker

L0756	Soares_multiple_sclerosis_2NbHMSP	multiple sclerosis lesions				pT7T3D (Pharmacia) with a modified polylinker V_TYPE
L0757	Soares_senescent_fibroblasts_NbHSF	senescent fibroblast				pT7T3D (Pharmacia) with a modified polylinker V_TYPE
L0758	Soares_testis_NHT					pT7T3D-Pac (Pharmacia) with a modified polylinker
L0759	Soares_total_fetus_Nb2H F8_9w					pT7T3D-Pac (Pharmacia) with a modified polylinker
L0760	Barstead aorta HPLRB3	aorta				pT7T3D-Pac (Pharmacia) with a modified polylinker
L0761	NCL_CGAP_CLL1	B-cell, chronic lymphocytic leukemia				pT7T3D-Pac (Pharmacia) with a modified polylinker
L0762	NCL_CGAP_Br1.1	breast				pT7T3D-Pac (Pharmacia) with a modified polylinker
L0763	NCL_CGAP_Br2	breast				pT7T3D-Pac (Pharmacia) with a modified polylinker
L0764	NCL_CGAP_Co3	colon				pT7T3D-Pac (Pharmacia) with a modified polylinker
L0765	NCL_CGAP_Co4	colon				pT7T3D-Pac (Pharmacia) with a modified polylinker
L0766	NCL_CGAP_GCB1	germinal center B cell				pT7T3D-Pac (Pharmacia) with a modified polylinker

L0767	NCL_CGAP_GC3	pooled germ cell tumors				pT7T3D-Pac (Pharmacia) with a modified polylinker
L0768	NCL_CGAP_GC4	pooled germ cell tumors				pT7T3D-Pac (Pharmacia) with a modified polylinker
L0769	NCL_CGAP_Bm25	anaplastic oligodendroglioma	brain			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0770	NCL_CGAP_Bm23	glioblastoma (pooled)	brain			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0771	NCL_CGAP_Co8	adenocarcinoma	colon			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0772	NCL_CGAP_Co10	colon tumor RER+	colon			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0773	NCL_CGAP_Co9	colon tumor RER+	colon			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0774	NCL_CGAP_Kid3		kidney			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0775	NCL_CGAP_Kid5	2 pooled tumors (clear cell type)	kidney			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0776	NCL_CGAP_Lu5	carcinoid	lung			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0777	Soares_NhHMPu_S1	Pooled human melanocyte, fetal heart, and pregnant	mixed (see below)			pT7T3D-Pac (Pharmacia) with a modified polylinker



L0778	Barstead pancreas HPLRB1		pancreas			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0779	Soares_NFL_T_GBC_S1		pooled			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0780	Soares_NSF_F8_9W_OT_ PA_P_S1		pooled			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0782	NCL_CGAP_Pr21	normal prostate	prostate			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0783	NCL_CGAP_Pr22	normal prostate	prostate			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0784	NCL_CGAP_Lei2	leiomyosarcoma	soft tissue			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0785	Barstead spleen HPLRB2		spleen			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0786	Soares_NbHFB		whole brain			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0787	NCL_CGAP_Sub1					pT7T3D-Pac (Pharmacia) with a modified polylinker
L0788	NCL_CGAP_Sub2					pT7T3D-Pac (Pharmacia) with a modified polylinker
L0789	NCL_CGAP_Sub3					pT7T3D-Pac (Pharmacia) with a modified polylinker

L0790	NCL_CGAP_Sub4					pT7T3D-Pac (Pharmacia) with a modified polylinker
L0791	NCL_CGAP_Sub5					pT7T3D-Pac (Pharmacia) with a modified polylinker
L0792	NCL_CGAP_Sub6					pT7T3D-Pac (Pharmacia) with a modified polylinker
L0793	NCL_CGAP_Sub7					pT7T3D-Pac (Pharmacia) with a modified polylinker
L0794	NCL_CGAP_GC6			pooled germ cell tumors		pT7T3D-Pac (Pharmacia) with a modified polylinker
L0796	NCL_CGAP_Bm50			medulloblastoma	brain	pT7T3D-Pac (Pharmacia) with a modified polylinker
L0800	NCL_CGAP_Co16			colon tumor, RER+	colon	pT7T3D-Pac (Pharmacia) with a modified polylinker
L0803	NCL_CGAP_Kid11				kidney	pT7T3D-Pac (Pharmacia) with a modified polylinker
L0804	NCL_CGAP_Kid12			2 pooled tumors (clear cell type)	kidney	pT7T3D-Pac (Pharmacia) with a modified polylinker
L0805	NCL_CGAP_Lu24			carcinoid	lung	pT7T3D-Pac (Pharmacia) with a modified polylinker
L0806	NCL_CGAP_Lu19			squamous cell carcinoma, poorly differentiated (4	lung	pT7T3D-Pac (Pharmacia) with a modified polylinker

L0807	NCI_CGAP_Ov18	fibrothoma	ovary			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0808	Barstead prostate BPH HPLRB4 1		prostate			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0809	NCI_CGAP_P28		prostate			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0879	BT0254		breast			puc18
L0946	BT0333		breast			puc18
L1057	BT0559		breast			puc18
L1441	CT0249		colon			puc18
L1446	CT0254		colon			puc18
L1499	CT0322		colon			puc18
L1651	HT0059		head_neck			puc18
L1788	HT0229		head_neck			puc18
L1819	HT0268		head_neck			puc18
L1877	HT0340		head_neck			puc18
L1878	HT0342		head_neck			puc18
L2174	ST0240		stomach			puc18
L2251	Human fetal lung	Fetal lung				
L2252	Human placenta	placenta				
L2255	GLC	corresponding non cancerous liver tissue				pBluescript sk(-)
L2257	NIH_MGC_65	adenocarcinoma	colon			pCMV-SPORT6
L2258	NIH_MGC_67	retinoblastoma	eye			pCMV-SPORT6
L2259	NIH_MGC_68	large cell carcinoma	lung			pCMV-SPORT6
L2260	NIH_MGC_69	large cell carcinoma, undifferentiated	lung			pCMV-SPORT6
L2261	NIH_MGC_70	epithelioid carcinoma	pancreas			pCMV-SPORT6
L2262	NIH_MGC_72	melanotic melanoma	skin			pCMV-SPORT6

L2263	NIH_MGC_66	adenocarcinoma	ovary		pCMV-SPORT6
L2264	NIH_MGC_71	leiomyosarcoma	uterus		pCMV-SPORT6
L2265	NIH_MGC_39	adenocarcinoma	pancreas		pOTB7
L2270	Lupski_dorsal_root_gangli on	dorsal root ganglia			pCMV-SPORT6 (Life Technologies)
L2281	BT0701		breast		puc18
L2289	BT0757		breast		puc18
L2333	CT0417		colon		puc18
L2338	CT0432		colon		puc18
L2346	CT0483		colon		puc18
L2357	UT0021		uterus_tum or		puc18
L2367	UT0039		uterus_tum or		puc18
L2377	NN0034		nervous_no rmal		puc18
L2380	NN0068		nervous_no rmal		puc18
L2402	NN0118		nervous_no rmal		puc18
L2412	NN0136		nervous_no rmal		puc18
L2413	NN0141		nervous_no rmal		puc18
L2467	NN1112		nervous_no rmal		puc18
L2497	HT0618		head_neck		puc18
L2498	HT0619		head_neck		puc18
L2504	HT0636		head_neck		puc18
L2518	HT0697		head_neck		puc18
L2519	HT0698		head_neck		puc18
L2522	HT0704		head_neck		puc18
L2539	HT0727		head_neck		puc18

L2543	HT0734			head_neck			puc18
L2550	HT0743			head_neck			puc18
L2570	HT0771			head_neck			puc18
L2598	HT0809			head_neck			puc18
L2599	HT0810			head_neck			puc18
L2637	HT0877			head_neck			puc18
L2640	HT0881			head_neck			puc18
L2647	HT0894			head_neck			puc18
L2650	HT0934			head_neck			puc18
L2651	NIH_MGC_20	melanotic melanoma		skin			pOTB7
L2653	NIH_MGC_58	hypernephroma		kidney			pDNR-LIB (Clontech)
L2654	NIH_MGC_9	adenocarcinoma cell line		ovary			pOTB7
L2655	NIH_MGC_55	from acute myelogenous leukemia		bone marrow			pDNR-LIB (Clontech)
L2657	NIH_MGC_54	from chronic myelogenous leukemia		bone marrow			pDNR-LIB (Clontech)
L2669	NT0022			nervous_tu mor			puc18
L2670	NT0023			nervous_tu mor			puc18
L2671	NT0024			nervous_tu mor			puc18
L2677	NT0039			nervous_tu mor			puc18
L2681	NT0048			nervous_tu mor			puc18
L2686	NT0058			nervous_tu mor			puc18
L2702	NT0098			nervous_tu mor			puc18
L2708	NT0104			nervous_tu mor			puc18
L2709	NT0105			nervous_tu			puc18

L2738	GN0049			mor	placenta_n ormal				puc18
L2767	FT0044				prostate_tu mor				puc18
L2791	FT0077				prostate_tu mor				puc18
L2799	FT0096				prostate_tu mor				puc18
L2800	FT0097				prostate_tu mor				puc18
L2814	FT0128				prostate_tu mor				puc18
L2817	FT0131				prostate_tu mor				puc18
L2831	FT0162				prostate_tu mor				puc18
L2842	UM0009				uterus				puc18
L2877	AN0027				amnion_no rmal				puc18
L2884	AN0041				amnion_no rmal				puc18
L2902	BN0036				breast_nor mal				puc18
L2904	BN0042				breast_nor mal				puc18
L2905	BN0046				breast_nor mal				puc18
L2906	BN0047				breast_nor mal				puc18
L2910	BN0070				breast_nor mal				puc18
L2915	BN0098				breast_nor				puc18

L2918	BN0114		mal			puc18
L2919	BN0115		breast_nor mal			puc18
L2962	BN0221		breast_nor mal			puc18
L2991	BN0264		breast_nor mal			puc18
L2999	BN0273		breast_nor mal			puc18
L3002	BN0276		breast_nor mal			puc18
L3012	BN0296		breast_nor mal			puc18
L3058	EN0004		lung_norm al			puc18
L3071	EN0026		lung_norm al			puc18
L3081	ET0005		lung_tumor			puc18
L3089	ET0018		lung_tumor			puc18
L3104	ET0041		lung_tumor			puc18
L3111	ET0058		lung_tumor			puc18
L3117	ET0068		lung_tumor			puc18
L3118	ET0070		lung_tumor			puc18
L3119	ET0072		lung_tumor			puc18
L3127	ET0084		lung_tumor			puc18
L3144	MT0035		marrow			puc18
L3153	MT0049		marrow			puc18
L3154	MT0050		marrow			puc18
L3158	MT0057		marrow			puc18
L3199	OT0019		ovary			puc18
L3204	OT0034		ovary			puc18

L3207	OT0063			ovary			puc18
L3210	OT0067			ovary			puc18
L3216	OT0086			ovary			puc18
L3262	FN0073			prostate_no rml			puc18
L3278	FN0104			prostate_no rml			puc18
L3281	FN0107			prostate_no rml			puc18
L3311	FN0180			prostate_no rml			puc18
L3312	FN0181			prostate_no rml			puc18
L3316	FN0188			prostate_no rml			puc18
L3352	TN0027			testis_norm al			puc18
L3357	TN0034			testis_norm al			puc18
L3372	TN0068			testis_norm al			puc18
L3374	TN0070			testis_norm al			puc18
L3377	TN0079			testis_norm al			puc18
L3378	TN0080			testis_norm al			puc18
L3387	GKB	hepatocellular carcinoma					pBluescript sk(-)
L3388	GKC	hepatocellular carcinoma					pBluescript sk(-)
L3391	NIH_MGC_53	carcinoma, cell line		bladder			pDNR-LJB (Clontech)
L3403	AN0087			amniot_no rml			puc18
L3404	AN0089			amniot_no			puc18



L3421				rmal			puc18
L3432	BT0634			breast			puc18
L3432	CT0461			colon			puc18
L3435	CT0465			colon			puc18
L3450	CT0508			colon			puc18
L3459	FT0175			prostate_tumor			puc18
L3480	GN0057			placenta_normal			puc18
L3484	GN0067			placenta_normal			puc18
L3485	GN0070			placenta_normal			puc18
L3491	GN0076			placenta_normal			puc18
L3496	HT0572			head_neck			puc18
L3499	HT0617			head_neck			puc18
L3503	HT0870			head_neck			puc18
L3504	HT0873			head_neck			puc18
L3506	HT0879			head_neck			puc18
L3511	HT0900			head_neck			puc18
L3516	HT0913			head_neck			puc18
L3518	HT0915			head_neck			puc18
L3521	HT0919			head_neck			puc18
L3530	HT0939			head_neck			puc18
L3561	TN0025			testis_normal			puc18
L3562	TN0030			testis_normal			puc18
L3586	TN0120			testis_normal			puc18
L3603	UM0093			uterus			puc18

L3618	UT0050			uterus_tum or		puc18
L3631	UT0072			uterus_tum or		puc18
L3632	UT0074			uterus_tum or		puc18
L3642	ADA	Adrenal gland				pBluescript sk(-)
L3643	ADB	Adrenal gland				pBluescript sk(-)
L3644	ADC	Adrenal gland				pBluescript sk(-)
L3645	Cu	adrenal cortico adenoma for Cushing's syndrome				pBluescript sk(-)
L3646	DCA					pTriplEx2
L3649	DCB					pTriplEx2
L3653	HTB	Hypothalamus				pBluescript sk(-)
L3655	HTC	Hypothalamus				pBluescript sk(-)
L3657	HTF	Hypothalamus				pBluescript sk(-)
L3658	cdA	pheochromocytoma				pTriplEx2
L3659	CB	cord blood				pBluescript
L3661	NPA	pituitary				pBluescript sk(-)
L3665	NIH_MGC_75			kidney		pDNR-LIB (Clontech)
L3667	NIH_MGC_79			placenta		pDNR-LIB (Clontech)
L3684	BT0812			breast		puc18
L3705	CT0486			colon		puc18
L3713	CT0524			colon		puc18
L3722	GN0030			placenta_n ormal		puc18
L3729	GN0079			placenta_n ormal		puc18
L3744	HT0916			head_neck		puc18
L3750	HT0945			head_neck		puc18
L3783	TN0136			testis_norm al		puc18

L3807	UT0077			uterus_tum or			puc18
L3808	UT0078			uterus_tum or			puc18
L3811	NPC		pituitary				pBluescript sk(-)
L3812	NPB		pituitary				pBluescript sk(-)
L3813	TP		pituitary tumor				pTriplEx2
L3814	BM		Bone marrow				pTriplEx2
L3815	MDS		Bone marrow				pTriplEx2
L3816	HEMBA1		whole embryo, mainly head				pME18SFL3
L3817	HEMBA1		whole embryo, mainly body				pME18SFL3
L3819	NIH_MGC_76			liver			pME18SFL3
L3824	NT2RM2				NT2		pDNR-LIB (Clontech)
L3825	NT2RM4				NT2		pME18SFL3
L3826	NT2RP1				NT2		pME18SFL3
L3827	NT2RP2				NT2		pUC19FL3
L3828	NT2RP3				NT2		pME18SFL3
L3829	NT2RP4				NT2		pME18SFL3
L3831	OVARC1		ovary, tumor tissue				pME18SFL3
L3832	PLACE1		placenta				pME18SFL3
L3833	PLACE2		placenta				pME18SFL3
L3834	PLACE3		placenta				pME18SFL3
L3837	THYRO1		thyroid gland				pME18SFL3
L3839	Y79AA1				Y79		pME18SFL3
L3841	NIH_MGC_18		large cell carcinoma	lung			pOTB7
L3871	NIH_MGC_19		neuroblastoma	brain			pOTB7
L3872	NCL_CGAP_Skn1			skin, 4 normal, 4 pooled sa			pCMV-SPORT6
L3904	NCL_CGAP_Bm64		glioblastoma with EGFR amplification	brain			pCMV-SPORT6
L3905	NCL_CGAP_Bm67		anaplastic	brain			pCMV-SPORT6

			oligodendroglioma with 1p/19q loss						pT7T3D-Pac (Pharmacia) with a modified polylinker
L4501	NCL_CGAP_Sub8								pAMP10
L4537	NCL_CGAP_Thy7		follicular adenoma (benign lesion)		thyroid				pAMP10
L4556	NCL_CGAP_HN13		squamous cell carcinoma		tongue				pCMV-SPORT6
L4560	NCL_CGAP_Ur7		tumor		uterus				pCMV-SPORT6
L4669	NCL_CGAP_Ov41		serous papillary tumor		ovary				pCMV-SPORT6
L4747	NCL_CGAP_Bm41		oligodendroglioma		brain				pT7T3D-Pac (Pharmacia) with a modified polylinker
L5286	NCL_CGAP_Thy10		medullary carcinoma		thyroid				pAMP10
L5564	NCL_CGAP_HN20				normal head/neck tissue				pAMP1
L5565	NCL_CGAP_Bm66		glioblastoma with probably TP53 mutation and witho		brain				pCMV-SPORT6
L5566	NCL_CGAP_Bm70		anaplastic oligodendroglioma		brain				pCMV-SPORT6.ccd
L5568	NCL_CGAP_HN21		nasopharyngeal carcinoma		head/neck				pAMP1
L5569	NCL_CGAP_HN17		normal epithelium		nasopharyn x				pAMP10
L5574	NCL_CGAP_HN19		normal epithelium		nasopharyn x				pAMP10
L5575	NCL_CGAP_Bm65		glioblastoma without EGFR amplification		brain				pCMV-SPORT6
L5622	NCL_CGAP_Skn3				skin				pCMV-SPORT6
L5623	NCL_CGAP_Skn4		squamous cell carcinoma		skin				pCMV-SPORT6

**Description of Table 5**

Table 5 provides a key to the OMIM reference identification numbers disclosed in Table 1B.1, column 9. OMIM reference identification numbers (Column 1) were derived from Online Mendelian Inheritance in Man (Online Mendelian Inheritance in Man, OMIM. McKusick-Nathans Institute for Genetic Medicine, Johns Hopkins University (Baltimore, MD) and National Center for Biotechnology Information, National Library of Medicine, (Bethesda, MD) 2000. World Wide Web URL: <http://www.ncbi.nlm.nih.gov/omim/>). Column 2 provides diseases associated with the cytologic band disclosed in Table 1B.1, column 8, as determined using the Morbid Map database.

**TABLE 5**

OMIM Reference	Description
100710	Myasthenic syndrome, slow-channel congenital, 601462
101000	Meningioma, NF2-related, sporadic Schwannoma, sporadic
101000	Neurofibromatosis, type 2
101000	Neurolemmomatosis
101000	Malignant mesothelioma, sporadic
102200	Somatotrophinoma
102578	Leukemia, acute promyelocytic, PML/RARA type
102770	Myoadenylate deaminase deficiency
102772	[AMP deaminase deficiency, erythrocytic]
103050	Autism, succinylpurinemic
103050	Adenylosuccinase deficiency
103581	Albright hereditary osteodystrophy-2
103600	[Dysalbuminemic hyperthyroxinemia]
103600	[Dysalbuminemic hyperzincemia], 194470
103600	Analbuminemia
103850	Aldolase A deficiency
104150	[AFP deficiency, congenital]
104150	[Hereditary persistence of alpha-fetoprotein]
104500	Amelogenesis imperfecta-2, hypoplastic local type
104770	Amyloidosis, secondary, susceptibility to
106100	Angioedema, hereditary
106150	Hypertension, essential, susceptibility to
106150	Preeclampsia, susceptibility to
106165	Hypertension, essential, 145500
106180	Myocardial infarction, susceptibility to
106210	Peters anomaly
106210	Cataract, congenital, with late-onset corneal dystrophy
106210	Foveal hypoplasia, isolated, 136520
106210	Aniridia
107271	CD59 deficiency
107300	Antithrombin III deficiency
107670	Apolipoprotein A-II deficiency
107741	Hyperlipoproteinemia, type III
107776	Colton blood group, 110450

107777	Diabetes insipidus, nephrogenic, autosomal recessive, 222000
108725	Atherosclerosis, susceptibility to
108985	Atrophia areata
109270	Renal tubular acidosis, distal, 179800
109270	Spherocytosis, hereditary
109270	[Acanthocytosis, one form]
109270	[Elliptocytosis, Malaysian-Melanesian type]
109270	Hemolytic anemia due to band 3 defect
109400	Basal cell nevus syndrome
109560	Leukemia/lymphoma, B-cell, 3
109690	Asthma, nocturnal, susceptibility to
109690	Obesity, susceptibility to
109700	Hemodialysis-related amyloidosis
110100	Blepharophimosis, epicanthus inversus, and ptosis, type 1
110700	Vivax malaria, susceptibility to
113100	Brachydactyly, type C
113900	Heart block, progressive familial, type I
114550	Hepatocellular carcinoma
114835	Monocyte carboxyesterase deficiency
115500	Acatalasemia
115665	Cataract, congenital, Volkmann type
116800	Cataract, Marner type
116806	Colorectal cancer
116860	Cavernous angiomatous malformations
117700	[Hypoceruloplasminemia, hereditary]
117700	Hemosiderosis, systemic, due to aceruloplasminemia
118485	Polycystic ovary syndrome with hyperandrogenemia
118800	Choreoathetosis, familial paroxysmal
120070	Alport syndrome, autosomal recessive, 203780
120120	Epidermolysis bullosa dystrophica, dominant, 131750
120120	Epidermolysis bullosa dystrophica, recessive, 226600
120120	Epidermolysis bullosa, pretibial, 131850
120131	Alport syndrome, autosomal recessive, 203780
120131	Hematuria, familial benign
120140	Osteoarthritis, precocious
120140	SED congenita
120140	SMED Strudwick type
120140	Stickler syndrome, type I
120140	Wagner syndrome, type II
120140	Achondrogenesis-hypochondrogenesis, type II
120140	Kniest dysplasia
120150	Osteogenesis imperfecta, 4 clinical forms, 166200, 166210, 259420, 166220
120150	Osteoporosis, idiopathic, 166710
120150	Ehlers-Danlos syndrome, type VIIA1, 130060
120215	Ehlers-Danlos syndrome, type I, 130000
120215	Ehlers-Danlos syndrome, type II, 130010
120220	Bethlem myopathy, 158810
120240	Bethlem myopathy, 158810
120260	Epiphyseal dysplasia, multiple, type 2, 600204
120435	Muir-Torre syndrome, 158320
120435	Colorectal cancer, hereditary, nonpolyposis, type 1 Ovarian cancer

120436	Muir-Torre family cancer syndrome, 158320
120436	Turcot syndrome with glioblastoma, 276300
120436	Colorectal cancer, hereditary nonpolyposis, type 2
120550	C1q deficiency, type A
120570	C1q deficiency, type B
120575	C1q deficiency, type C
120700	C3 deficiency
120950	C8 deficiency, type I
120960	C8 deficiency, type II
121011	Deafness, autosomal dominant 3, 601544
121011	Deafness, autosomal recessive 1, 220290
121050	Contractural arachnodactyly, congenital
121360	Myeloid leukemia, acute, M4Eo subtype
121800	Corneal dystrophy, crystalline, Schnyder
122720	Nicotine addiction, protection from
122720	Coumarin resistance, 122700
123000	Craniofacial dysplasia
123101	Craniosynostosis, type 2
123270	[Creatine kinase, brain type, ectopic expression of]
123580	Cataract, congenital, autosomal dominant
123620	Cataract, cerulean, type 2, 601547
123660	Cataract, Coppock-like
123940	White sponge nevus, 193900
124030	Parkinsonism, susceptibility to
124030	Debrisoquine sensitivity
124200	Darier disease (keratosis follicularis)
125270	Porphyria, acute hepatic
125270	Lead poisoning, susceptibility to
125370	Dentatorubro-pallidoluysian atrophy
125660	Myopathy, desminopathic
125660	Cardiomyopathy
126090	Hyperphenylalaninemia due to pterin-4a-carbinolamine dehydratase deficiency, 264070
126337	Myxoid liposarcoma
126340	Xeroderma pigmentosum, group D, 278730
126391	DNA ligase I deficiency
126600	Drusen, radial, autosomal dominant
128100	Dystonia-1, torsion
129010	Neuropathy, congenital hypomyelinating, 1
129500	Ectodermal dysplasia, hidrotic
129900	EEC syndrome-I
130410	Glutaricaciduria, type IIB
130500	Elliptocytosis-1
131100	Multiple endocrine neoplasia I
131100	Prolactinoma, hyperparathyroidism, carcinoid syndrome
131100	Carcinoid tumor of lung
131210	Atherosclerosis, susceptibility to
131244	Hirschsprung disease-2, 600155
131400	Eosinophilia, familial
132700	Cylindromatosis
132800	Basal cell carcinoma
132800	Epithelioma, self-healing, squamous 1, Ferguson-Smith type

133171	[Erythrocytosis, familial], 133100
133200	Erythrokeratoderma variabilis
133530	Xeroderma pigmentosum, group G, 278780
133701	Exostoses, multiple, type 2
133780	Vitreoretinopathy, exudative, familial
134790	Hyperferritinemia-cataract syndrome, 600886
135300	Fibromatosis, gingival
135940	Ichthyosis vulgaris, 146700
136132	[Fish-odor syndrome], 602079
136350	Pfeiffer syndrome, 101600
136435	Ovarian dysgenesis, hypergonadotropic, with normal karyotype, 233300
136530	Male infertility, familial
136550	Macular dystrophy, North Carolina type
136836	Fucosyltransferase-6 deficiency
137350	Amyloidosis, Finnish type, 105120
138030	[Hyperproglucagonemia]
138040	Cortisol resistance
138079	Hyperinsulinism, familial, 602485
138079	MODY, type 2, 125851
138140	Glucose transport defect, blood-brain barrier
138160	Diabetes mellitus, noninsulin-dependent
138160	Fanconi-Bickel syndrome, 227810
138300	Hemolytic anemia due to glutathione reductase deficiency
138320	Hemolytic anemia due to glutathione peroxidase deficiency
138570	Non-insulin dependent diabetes mellitus, susceptibility to
138700	[Apolipoprotein H deficiency]
138981	Pulmonary alveolar proteinosis, 265120
139190	Gigantism due to GHRF hypersecretion
139190	Isolated growth hormone deficiency due to defect in GHRF
139191	Growth hormone deficient dwarfism
139250	Isolated growth hormone deficiency, Illig type with absent GH and Kowarski type with bioinactive GH
139350	Epidermolytic hyperkeratosis, 113800
139350	Keratoderma, palmoplantar, nonepidermolytic
140100	[Anhaptoglobinemia]
140100	[Hypohaptoglobinemia]
141750	Alpha-thalassemia/mental retardation syndrome, type 1
141800	Methemoglobinemias, alpha-
141800	Thalassemias, alpha-
141800	Erythremias, alpha-
141800	Heinz body anemias, alpha-
141850	Thalassemia, alpha-
141850	Erythrocytosis
141850	Heinz body anemia
141850	Hemoglobin H disease
141850	Hypochromic microcytic anemia
142335	Hereditary persistence of fetal hemoglobin, heterocellular, Indian type
142600	Hemolytic anemia due to hexokinase deficiency
143890	Hypercholesterolemia, familial
144120	Hyperimmunoglobulin G1 syndrome
145001	Hyperparathyroidism-jaw tumor syndrome



145260	Pseudohypoaldosteronism, type II
145981	Hypocalciuric hypercalcemia, type II
146150	Hypomelanosis of Ito
146200	Hypoparathyroidism, familial
146760	[IgG receptor I, phagocytic, familial deficiency of]
146790	Lupus nephritis, susceptibility to
147020	Agammaglobulinemia, 601495
147050	Atopy
147110	IgG2 deficiency, selective
147141	Leukemia, acute lymphoblastic
147440	Growth retardation with deafness and mental retardation
147670	Rabson-Mendenhall syndrome
147670	Diabetes mellitus, insulin-resistant, with acanthosis nigricans
147670	Leprechaunism
147781	Atopy, susceptibility to
148040	Epidermolysis bullosa simplex, Koebner, Dowling-Meara, and Weber-Cockayne types, 131900, 131760, 131800
148041	Pachyonychia congenita, Jadassohn-Lewandowsky type, 167200
148043	Meesmann corneal dystrophy, 122100
148065	White sponge nevus, 193900
148070	Liver disease, susceptibility to, from hepatotoxins or viruses
148080	Epidermolytic hyperkeratosis, 113800
148370	Keratolytic winter erythema
148900	Klippel-Feil syndrome with laryngeal malformation
150200	[Placental lactogen deficiency]
150210	Lactoferrin-deficient neutrophils, 245480
150250	Larsen syndrome, autosomal dominant
150292	Epidermolysis bullosa, Herlitz junctional type, 226700
151385	Leukemia, acute myeloid
151390	Leukemia, acute T-cell
151410	Leukemia, chronic myeloid
151440	Leukemia, T-cell acute lymphoblastoid
151670	Hepatic lipase deficiency
152200	Coronary artery disease, susceptibility to
152427	Long QT syndrome-2
152445	Vohwinkel syndrome, 124500
152445	Erythrokeratoderma, progressive symmetric, 602036
152760	Hypogonadotropic hypogonadism due to GNRH deficiency, 227200
152780	Hypogonadism, hypergonadotropic
152780	Male pseudohermaphroditism due to defective LH
152790	Precocious puberty, male, 176410
152790	Leydig cell hypoplasia
153454	Ehlers-Danlos syndrome, type VI, 225400
153455	Cutis laxa, recessive, type I, 219100
153700	Macular dystrophy, vitelliform type
154275	Malignant hyperthermia susceptibility 2
154276	Malignant hyperthermia susceptibility 3
154400	Acrofacial dysostosis, Nager type
154545	Chronic infections, due to opsonin defect
154550	Carbohydrate-deficient glycoprotein syndrome, type Ib, 602579
156845	Tietz syndrome, 103500
156845	Waardenburg syndrome, type IIA, 193510

156845	Waardenburg syndrome/ocular albinism, digenic, 103470
156850	Cataract, congenital, with microphthalmia
157147	Abetalipoproteinemia, 200100
157170	Holoprosencephaly-2
157640	PEO with mitochondrial DNA deletions, type 1
157900	Moebius syndrome
158590	Spinal muscular atrophy-4
159000	Muscular dystrophy, limb-girdle, type 1A
159001	Muscular dystrophy, limb-girdle, type 1B
160760	Cardiomyopathy, familial hypertrophic, 1, 192600
160760	Central core disease, one form
160781	Cardiomyopathy, hypertrophic, mid-left ventricular chamber type
160900	Myotonic dystrophy
161015	Mitochondrial complex I deficiency, 252010
162150	Obesity with impaired prohormone processing, 600955
162200	Neurofibromatosis, type 1
162200	Watson syndrome, 193520
162400	Neuropathy, hereditary sensory and autonomic, type 1
163729	Hypertension, pregnancy-induced
163950	Noonan syndrome-1
163950	Cardiofaciocutaneous syndrome, 115150
164009	Leukemia, acute promyelocytic, NUMA/RARA type
164500	Spinocerebellar ataxia-7
164731	Ovarian carcinoma, 167000
164770	Myeloid malignancy, predisposition to
164920	Piebaldism
164920	Mast cell leukemia
164920	Mastocytosis with associated hematologic disorder
164953	Liposarcoma
165240	Pallister-Hall syndrome, 146510
165240	Postaxial polydactyly type A1, 174200
165240	Greig cephalopolysyndactyly syndrome, 175700
165320	Hepatocellular carcinoma
167000	Ovarian cancer, serous
167410	Rhabdomyosarcoma, alveolar, 268220
168360	Paraneoplastic sensory neuropathy
168450	Hypoparathyroidism, autosomal dominant
168450	Hypoparathyroidism, autosomal recessive
168461	Multiple myeloma, 254250
168461	Parathyroid adenomatosis 1
168461	Centrocytic lymphoma
168468	Metaphyseal chondrodysplasia, Murk Jansen type, 156400
168500	Parietal foramina
169600	Hailey-Hailey disease
170500	Myotonia congenita, atypical acetazolamide-responsive
170500	Paramyotonia congenita, 168300
170500	Hyperkalemic periodic paralysis
170650	Periodontitis, juvenile
171190	Hypertension, essential, 145500
171650	Lysosomal acid phosphatase deficiency
171760	Hypophosphatasia, adult, 146300
171760	Hypophosphatasia, infantile, 241500

171860	Hemolytic anemia due to phosphofructokinase deficiency
172400	Hemolytic anemia due to glucosephosphate isomerase deficiency
172400	Hydrops fetalis, one form
172430	Enolase deficiency
172471	Glycogenosis, hepatic, autosomal
172490	Phosphorylase kinase deficiency of liver and muscle, 261750
173610	Platelet alpha/delta storage pool deficiency
173850	Polio, susceptibility to
173870	Xeroderma pigmentosum
173870	Fanconi anemia
173910	Polycystic kidney disease, adult, type II
174000	Medullary cystic kidney disease, AD
174900	Polyposis, juvenile intestinal
175100	Turcot syndrome, 276300
175100	Adenomatous polyposis coli
175100	Adenomatous polyposis coli, attenuated
175100	Colorectal cancer
175100	Desmoid disease, hereditary, 135290
175100	Gardner syndrome
176100	Porphyria cutanea tarda
176100	Porphyria, hepatoerythropoietic
176261	Jervell and Lange-Nielsen syndrome, 220400
176270	Prader-Willi syndrome
176450	Sacral agenesis-1
176830	Obesity, adrenal insufficiency, and red hair
176830	ACTH deficiency
176930	Dysprothrombinemia
176930	Hypoprothrombinemia
176960	Pituitary tumor, invasive
177400	Apnea, postanesthetic
178300	Ptois, hereditary congenital, 1
178640	Pulmonary alveolar proteinosis, congenital, 265120
179095	Male infertility
179615	Reticulosis, familial histiocytic, 267700
179615	Severe combined immunodeficiency, B cell-negative, 601457
179616	Severe combined immunodeficiency, B cell-negative, 601457
179755	Renal cell carcinoma, papillary, 1
180071	Retinitis pigmentosa, autosomal recessive
180100	Retinitis pigmentosa-1
180104	Retinitis pigmentosa-9
180105	Retinitis pigmentosa-10
180380	Night blindness, congenital stationary, rhodopsin-related
180380	Retinitis pigmentosa, autosomal recessive
180380	Retinitis pigmentosa-4, autosomal dominant
180385	Leukemia, acute T-cell
180721	Retinitis pigmentosa, digenic
180840	Susceptibility to IDDM
180901	Malignant hyperthermia susceptibility 1, 145600
180901	Central core disease, 117000
181405	Scapuloperoneal spinal muscular atrophy, New England type
181430	Scapuloperoneal syndrome, myopathic type
181460	Schistosoma mansoni, susceptibility/resistance to

182138	Anxiety-related personality traits
182280	Small-cell cancer of lung
182290	Smith-Magenis syndrome
182380	Glucose/galactose malabsorption
182381	Renal glucosuria, 253100
182600	Spastic paraplegia-3A
182601	Spastic paraplegia-4
182860	Pyropoikilocytosis
182860	Spherocytosis, recessive
182860	Elliptocytosis-2
182900	Spherocytosis-2
185800	Symphalangism, proximal
186580	Arthrocuteaneouveal granulomatosis
186855	Leukemia-2, T-cell acute lymphoblastic
186880	Leukemia/lymphoma, T-cell
186921	Leukemia, T-cell acute lymphoblastic
187040	Leukemia-1, T-cell acute lymphoblastic
188070	Bleeding disorder due to defective thromboxane A2 receptor
188450	Goiter, adolescent multinodular
188450	Goiter, nonendemic, simple
188450	Hypothyroidism, hereditary congenital
188826	Sorsby fundus dystrophy, 136900
189800	Preeclampsia/eclampsia
190040	Meningioma, SIS-related
190040	Dermatofibrosarcoma protuberans
190040	Giant-cell fibroblastoma
190195	Ichthyosiform erythroderma, congenital, 242100
190195	Ichthyosis, lamellar, autosomal recessive, 242300
190198	Leukemia, T-cell acute lymphoblastic
190300	Tremor, familial essential, 1
190605	Triphalangeal thumb-polysyndactyly syndrome
190685	Down syndrome
191044	Cardiomyopathy, familial hypertrophic
191092	Tuberous sclerosis-2
191100	Tuberous sclerosis-1
191181	Cervical carcinoma
191315	Insensitivity to pain, congenital, with anhidrosis, 256800
192090	Ovarian carcinoma
192090	Breast cancer, lobular
192090	Endometrial carcinoma
192090	Gastric cancer, familial, 137215
192974	Neonatal alloimmune thrombocytopenia
192974	Glycoprotein Ia deficiency
193235	Vitreoretinopathy, neovascular inflammatory
193500	Rhabdomyosarcoma, alveolar, 268220
193500	Waardenburg syndrome, type I
193500	Waardenburg syndrome, type III, 148820
193500	Craniofacial-deafness-hand syndrome, 122880
194070	Wilms tumor, type 1
194070	Denys-Drash syndrome
194070	Frasier syndrome, 136680
201460	Acyl-CoA dehydrogenase, long chain, deficiency of

201475	VLCAD deficiency
201810	3-beta-hydroxysteroid dehydrogenase, type II, deficiency
203300	Hermansky-Pudlak syndrome
203310	Ocular albinism, autosomal recessive
203500	Alkaptonuria
203740	Alpha-ketoglutarate dehydrogenase deficiency
205100	Amyotrophic lateral sclerosis, juvenile
205900	Anemia, Diamond-Blackfan
207750	Hyperlipoproteinemia, type Ib
208250	Jacobs syndrome
208400	Aspartylglucosaminuria
209901	Bardet-Biedl syndrome 1
212138	Carnitine-acylcarnitine translocase deficiency
215700	Citrullinemia
216550	Cohen syndrome
216900	Achromatopsia
217300	Cornea plana congenita, recessive
217800	Macular corneal dystrophy
218000	Andermann syndrome
218030	Apparent mineralocorticoid excess, hypertension due to
219800	Cystinosis, nephropathic
221770	Polycystic lipomembranous osteodysplasia with sclerosing leukencephalopathy
221820	Gliososis, familial progressive subcortical
222700	Lysinuric protein intolerance
222800	Hemolytic anemia due to bisphosphoglycerate mutase deficiency
222900	Sucrose intolerance
223360	Dopamine-beta-hydroxylase deficiency
223900	Dysautonomia, familial
224100	Congenital dyserythropoietic anemia II
225500	Ellis-van Creveld syndrome
227220	[Eye color, brown]
227645	Fanconi anemia, type C
229700	Fructose-bisphosphatase deficiency
229800	[Fructosuria]
230000	Fucosidosis
230400	Galactosemia
230800	Gaucher disease
230800	Gaucher disease with cardiovascular calcification
231550	Achalasia-addisonianism-alacrimia syndrome
231670	Glutaricaciduria, type I
231675	Glutaricaciduria, type IIC
231680	Glutaricaciduria, type IIA
232050	Propionicacidemia, type II or pccB type
232300	Glycogen storage disease II
232600	McArdle disease
232700	Glycogen storage disease VI
232800	Glycogen storage disease VII
233700	Chronic granulomatous disease due to deficiency of NCF-1
236100	Holoprosencephaly-1
236200	Homocystinuria, B6-responsive and nonresponsive types
236250	Homocystinuria due to MTHFR deficiency

236730	Urofacial syndrome
237300	Carbamoylphosphate synthetase I deficiency
238310	Hyperglycinemia, nonketotic, type II
238600	Chylomicronemia syndrome, familial
238600	Combined hyperlipemia, familial
238600	Hyperlipoproteinemia I
238600	Lipoprotein lipase deficiency
239100	Van Buchem disease
240300	Autoimmune polyglandular disease, type I
240400	Scurvy
245200	Krabbe disease
245349	Lacticacidemia due to PDX1 deficiency
245900	Norum disease
245900	Fish-eye disease
246450	HMG-CoA lyase deficiency
248510	Mannosidosis, beta-
248600	Maple syrup urine disease, type Ia
249000	Meckel syndrome
250250	Cartilage-hair hypoplasia
250790	Methemoglobinemia due to cytochrome b5 deficiency
250850	Hypermethioninemia, persistent, autosomal dominant, due to methionine adenosyltransferase I/III deficiency
251170	Mevalonicaciduria
251600	Microphthalmia, autosomal recessive
252500	Mucopolipidosis II
252500	Mucopolipidosis III
252900	Sanfilippo syndrome, type A
253250	Mulibrey nanism
253800	Walker-Warburg syndrome, 236670
253800	Fukuyama type congenital muscular dystrophy
255800	Schwartz-Jampel syndrome
256030	Nemaline myopathy-2
256540	Galactosialidosis
256700	Neuroblastoma
256731	Ceroid-lipofuscinosis, neuronal-5, variant late infantile
257200	Niemann-Pick disease, type A
257200	Niemann-Pick disease, type B
258501	3-methylglutaconicaciduria, type III
258900	Oroticaciduria
259700	Osteopetrosis, recessive
259770	Osteoporosis-pseudoglioma syndrome
259900	Hyperoxaluria, primary, type I
261670	Myopathy due to phosphoglycerate mutase deficiency
262000	Bjornstad syndrome
266200	Anemia, hemolytic, due to PK deficiency
267750	Knobloch syndrome
268900	[Sarcosinemia]
269920	Salla disease
270100	Situs inversus viscerum
270200	Sjogren-Larsson syndrome
272750	GM2-gangliosidosis, AB variant
272800	Tay-Sachs disease

272800	[Hex A pseudodeficiency]
272800	GM2-gangliosidosis, juvenile, adult
276600	Tyrosinemia, type II
276700	Tyrosinemia, type I
276710	Tyrosinemia, type III
276900	Usher syndrome, type 1A
276901	Usher syndrome, type 2
276902	Usher syndrome, type 3
277700	Werner syndrome
277730	Wernicke-Korsakoff syndrome, susceptibility to
278700	Xeroderma pigmentosum, group A
300000	Opitz G syndrome, type I
300008	Nephrolithiasis, type I, 310468
300008	Proteinuria, low molecular weight, with hypercalciuric nephrocalcinosis
300008	Dent disease, 300009
300008	Hypophosphatemia, type III
300011	Menkes disease, 309400
300011	Occipital horn syndrome, 304150
300011	Cutis laxa, neonatal
300031	Mental retardation, X-linked, FRAXF type
300044	Wernicke-Korsakoff syndrome, susceptibility to
300046	Mental retardation, X-linked 23, nonspecific
300047	Mental retardation, X-linked 20
300048	Intestinal pseudoobstruction, neuronal, X-linked
300049	Nodular heterotopia, bilateral periventricular
300049	BPNH/MR syndrome
300055	Mental retardation with psychosis, pyramidal signs, and macroorchidism
300066	Deafness, X-linked 6, sensorineural
300071	Night blindness, congenital stationary, type 2
300075	Coffin-Lowry syndrome, 303600
300077	Mental retardation, X-linked 29
300100	Adrenoleukodystrophy
300100	Adrenomyeloneuropathy
300104	Mental retardation, X-linked nonspecific, 309541
300110	Night blindness, congenital stationary, X-linked incomplete, 300071
300123	Mental retardation with isolated growth hormone deficiency
300126	Dyskeratosis congenita-1, 305000
300127	Mental retardation, X-linked, 60
300310	Agammaglobulinemia, type 2, X-linked
300600	Ocular albinism, Forsius-Eriksson type
301000	Thrombocytopenia, X-linked, 313900
301000	Wiskott-Aldrich syndrome
301200	Amelogenesis imperfecta
301201	Amelogenesis imperfecta-3, hypoplastic type
301220	Partington syndrome II
301590	Anophthalmos-I
301830	Arthrogryposis, X-linked (spinal muscular atrophy, infantile, X-linked)
301835	Arts syndrome
301845	Bazex syndrome

302060	Noncompaction of left ventricular myocardium, isolated
302060	Barth syndrome
302060	Cardiomyopathy, X-linked dilated, 300069
302060	Endocardial fibroelastosis-2
302350	Nance-Horan syndrome
302801	Charcot-Marie-Tooth neuropathy, X-linked-2, recessive
302960	Chondrodysplasia punctata, X-linked dominant
303700	Colorblindness, blue monochromatic
303800	Colorblindness, deutan
303900	Colorblindness, protan
304050	Aicardi syndrome
304110	Craniofrontonasal dysplasia
304800	Diabetes insipidus, nephrogenic
305435	Heterocellular hereditary persistence of fetal hemoglobin, Swiss type
305450	FG syndrome
305900	Favism
305900	G6PD deficiency
305900	Hemolytic anemia due to G6PD deficiency
306000	Glycogenosis, X-linked hepatic, type I
306000	Glycogenosis, X-linked hepatic, type II
306100	Gonadal dysgenesis, XY female type
306700	Hemophilia A
306995	[Homosexuality, male]
307150	Hypertrichosis, congenital generalized
307800	Hypophosphatemia, hereditary
308310	Incontinentia pigmenti, familial
308800	Keratosis follicularis spinulosa decalvans
308840	Spastic paraplegia, 312900
308840	Hydrocephalus due to aqueductal stenosis, 307000
308840	MASA syndrome, 303350
309200	Manic-depressive illness, X-linked
309470	Mental retardation, X-linked, syndromic-3, with spastic diplegia
309500	Renpenning syndrome-1
309510	Mental retardation, X-linked, syndromic-1, with dystonic movements, ataxia, and seizures
309530	Mental retardation, X-linked 1, non-dysmorphic
309548	Mental retardation, X-linked, FRAXE type
309585	Mental retardation, X-linked, syndromic-6, with gynecomastia and obesity
309605	Mental retardation, X-linked, syndromic-4, with congenital contractures and low fingertip arches
309610	Mental retardation, X-linked, syndromic-2, with dysmorphism and cerebral atrophy
309620	Mental retardation-skeletal dysplasia
309850	Brunner syndrome
309900	Mucopolysaccharidosis II
310300	Emery-Dreifuss muscular dystrophy
310400	Myotubular myopathy, X-linked
310460	Myopia-1
310460	Bornholm eye disease
310490	Cowchock syndrome
311050	Optic atrophy, X-linked



311200	Oral-facial-digital syndrome 1
311300	Otopalatodigital syndrome, type I
311510	Waisman parkinsonism-mental retardation syndrome
311850	Phosphoribosyl pyrophosphate synthetase-related gout
312040	N syndrome, 310465
312060	Properdin deficiency, X-linked
312170	Pyruvate dehydrogenase deficiency
312700	Retinoschisis
313400	Spondyloepiphyseal dysplasia tarda
313700	Perineal hypospadias
313700	Prostate cancer
313700	Spinal and bulbar muscular atrophy of Kennedy, 313200
313700	Breast cancer, male, with Reifstein syndrome
313700	Androgen insensitivity, several forms
314300	Goeminne TKCR syndrome
314400	Cardiac valvular dysplasia-1
314580	Wieacker-Wolff syndrome
600040	Colorectal cancer
600045	Xeroderma pigmentosum, group E, subtype 2
600065	Leukocyte adhesion deficiency, 116920
600079	Colon cancer
600101	Deafness, autosomal dominant 2
600119	Muscular dystrophy, Duchenne-like, type 2
600119	Adhalinopathy, primary
600138	Retinitis pigmentosa-11
600140	Rubenstein-Taybi syndrome, 180849
600143	Epilepsy, progressive, with mental retardation
600163	Long QT syndrome-3
600173	SCID, autosomal recessive, T-negative/B-positive type
600175	Spinal muscular atrophy, congenital nonprogressive, of lower limbs
600194	Ichthyosis bullosa of Siemens, 146800
600223	Spinocerebellar ataxia-4
600231	Palmoplantar keratoderma, Bothnia type
600234	HMG-CoA synthase-2 deficiency
600243	Temperature-sensitive apoptosis
600259	Turcot syndrome with glioblastoma, 276300
600259	Colorectal cancer, hereditary nonpolyposis, type 4
600266	Resistance/susceptibility to TB, etc.
600273	Polycystic kidney disease, infantile severe, with tuberous sclerosis
600276	Cerebral arteriopathy with subcortical infarcts and leukoencephalopathy, 125310
600281	Non-insulin-dependent diabetes mellitus, 125853
600281	MODY, type 1, 125850
600309	Atrioventricular canal defect-1
600310	Pseudoachondroplasia, 177170
600310	Epiphyseal dysplasia, multiple 1, 132400
600319	Diabetes mellitus, insulin-dependent, 4
600320	Insulin-dependent diabetes mellitus-5
600332	Rippling muscle disease-1
600374	Bardet-Biedl syndrome 4
600510	Pigment dispersion syndrome
600512	Epilepsy, partial

600525	Trichodontoosseous syndrome, 190320
600528	CPT deficiency, hepatic, type I, 255120
600536	Myopathy, congenital
600584	Atrial septal defect with atrioventricular conduction defects, 108900
600593	Craniosynostosis, Adelaide type
600617	Lipoid adrenal hyperplasia, 201710
600623	Prostate cancer, 176807
600631	Enuresis, nocturnal, 1
600650	Myopathy due to CPT II deficiency, 255110
600650	CPT deficiency, hepatic, type II, 600649
600652	Deafness, autosomal dominant 4
600698	Salivary adenoma
600698	Uterine leiomyoma
600698	Lipoma
600698	Lipomatosis, mutiple, 151900
600722	Ceroid lipofuscinosis, neuronal, variant juvenile type, with granular osmiophilic deposits
600722	Ceroid lipofuscinosis, neuronal-1, infantile, 256730
600725	Holoprosencephaly-3, 142945
600757	Orofacial cleft-3
600759	Alzheimer disease-4
600792	Deafness, autosomal recessive 5
600807	Bronchial asthma
600808	Enuresis, nocturnal, 2
600811	Xeroderma pigmentosum, group E, DDB-negative subtype, 278740
600850	Schizophrenia disorder-4
600852	Retinitis pigmentosa-17
600881	Cataract, congenital, zonular, with sutural opacities
600882	Charcot-Marie-Tooth neuropathy-2B
600883	Diabetes mellitus, insulin-dependent, 8
600897	Cataract, zonular pulverulent-1, 116200
600900	Muscular dystrophy, limb-girdle, type 2E
600918	Cystinuria, type III
600956	Persistent Mullerian duct syndrome, type II, 261550
600957	Persistent Mullerian duct syndrome, type I, 261550
600958	Cardiomyopathy, familial hypertrophic, 4, 115197
600968	Gitelman syndrome, 263800
600971	Deafness, autosomal recessive 6
600975	Glaucoma 3, primary infantile, B
600995	Nephrotic syndrome, idiopathic, steroid-resistant
600996	Arrhythmogenic right ventricular dysplasia-2
601002	5-oxoprolinuria, 266130
601002	Hemolytic anemia due to glutathione synthetase deficiency, 231900
601072	Deafness, autosomal recessive 8
601097	Neuropathy, recurrent, with pressure palsies, 162500
601097	Charcot-Marie-Tooth neuropathy-1A, 118220
601097	Dejerine-Sottas disease, PMP22 related, 145900
601105	Pycnodysostosis, 265800
601145	Epilepsy, progressive myoclonic I, 254800
601146	Brachydactyly, type C, 113100
601146	Acromesomelic dysplasia, Hunter-Thompson type, 201250
601146	Chondrodysplasia, Grebe type, 200700

601199	Neonatal hyperparathyroidism, 239200
601199	Hypocalcemia, autosomal dominant, 601198
601199	Hypocalciuric hypercalcemia, type I, 145980
601226	Progressive external ophthalmoplegia, type 2
601238	Cerebellar ataxia, Cayman type
601277	Ichthyosis, lamellar, type 2
601284	Hereditary hemorrhagic telangiectasia-2, 600376
601295	Bile acid malabsorption, primary
601309	Basal cell carcinoma, sporadic
601309	Basal cell nevus syndrome, 109400
601313	Polycystic kidney disease, adult type I, 173900
601369	Deafness, autosomal dominant 9
601385	Prostate cancer
601386	Deafness, autosomal recessive 12
601399	Platelet disorder, familial, with associated myeloid malignancy
601402	Leukemia, myeloid, acute
601412	Deafness, autosomal dominant 7
601414	Retinitis pigmentosa-18
601458	Inflammatory bowel disease-2
601471	Moebius syndrome-2
601472	Charcot-Marie-Tooth neuropathy-2D
601493	Cardiomyopathy, dilated 1C
601517	Spinocerebellar ataxia-2, 183090
601518	Prostate cancer, hereditary, 1, 176807
601596	Charcot-Marie-Tooth neuropathy, demyelinating
601604	Mycobacterial and salmonella infections, susceptibility to
601623	Angelman syndrome
601649	Blepharophimosis, epicanthus inversus, and ptosis, type 2
601652	Glaucoma 1A, primary open angle, juvenile-onset, 137750
601669	Hirschsprung disease, one form
601682	Glaucoma 1C, primary open angle
601691	Retinitis pigmentosa-19, 601718
601691	Stargardt disease-1, 248200
601691	Cone-rod dystrophy 3
601691	Fundus flavimaculatus with macular dystrophy, 248200
601692	Reis-Bucklers corneal dystrophy
601692	Corneal dystrophy, Avellino type
601692	Corneal dystrophy, Groenouw type I, 121900
601692	Corneal dystrophy, lattice type I, 122200
601718	Retinitis pigmentosa-19
601744	Systemic lupus erythematosus, susceptibility to, 1
601769	Osteoporosis, involutional
601769	Rickets, vitamin D-resistant, 277440
601771	Glaucoma 3A, primary infantile, 231300
601780	Ceroid-lipofuscinosis, neuronal-6, variant late infantile
601785	Carbohydrate-deficient glycoprotein syndrome, type I, 212065
601800	[Hair color, brown]
601843	Hypothyroidism, congenital, 274400
601844	Pseudohypoadosteronism type II
601846	Muscular dystrophy with rimmed vacuoles
601850	Retinitis pigmentosa-deafness syndrome
601863	Bare lymphocyte syndrome, complementation group C

601884	[High bone mass]
601885	Cataract, zonular pulverulent-2
601889	Lymphoma, diffuse large cell
601928	Monilethrix, 158000
601954	Muscular dystrophy, limb-girdle, type 2G
601975	Ectodermal dysplasia/skin fragility syndrome
602025	Obesity/hyperinsulinism, susceptibility to
602085	Postaxial polydactyly, type A2
602086	Arrhythmogenic right ventricular dysplasia-3
602088	Nephronophthisis, infantile
602089	Hemangioma, capillary, hereditary
602092	Deafness, autosomal recessive 18
602094	Lipodystrophy, familial partial
602116	Glioma
602117	Prader-Willi syndrome
602121	Deafness, autosomal dominant nonsyndromic sensorineural, 1, 124900
602134	Tremor, familial essential, 2
602136	Refsum disease, infantile, 266510
602136	Zellweger syndrome-1, 214100
602136	Adrenoleukodystrophy, neonatal, 202370
602153	Monilethrix, 158000
602216	Peutz-Jeghers syndrome, 175200
602221	Stem-cell leukemia/lymphoma syndrome
602225	Cone-rod retinal dystrophy-2, 120970
602225	Leber congenital amaurosis, type III
602279	Oculopharyngeal muscular dystrophy, 164300
602279	Oculopharyngeal muscular dystrophy, autosomal recessive, 257950
602363	Ellis-van Creveld-like syndrome
602403	Alzheimer disease, susceptibility to
602447	Coronary artery disease, susceptibility to
602460	Deafness, autosomal dominant 15, 602459
602477	Febrile convulsions, familial, 2
602491	Hyperlipidemia, familial combined, 1
602544	Parkinson disease, juvenile, type 2, 600116
602568	Homocystinuria-megaloblastic anemia, cbl E type, 236270
602629	Dystonia-6, torsion
602666	Deafness, autosomal recessive 3, 600316
602716	Nephrosis-1, congenital, Finnish type, 256300
602772	Retinitis pigmentosa-24
602782	Faisalabad histiocytosis

#### *Mature Polypeptides*

The present invention also encompasses mature forms of a polypeptide having the amino acid sequence of SEQ ID NO:Y and/or the amino acid sequence encoded by the cDNA in a deposited clone. Polynucleotides encoding the mature forms (such as, for example, the

5 polynucleotide sequence in SEQ ID NO:X and/or the polynucleotide sequence contained in the cDNA of a deposited clone) are also encompassed by the invention. Moreover, fragments or variants of these polypeptides (such as, fragments as described herein, polypeptides at least 80%,

85%, 90%, 95%, 96%, 97%, 98%, 99%, or 100% identical to these polypeptides, or polypeptides encoded by a polynucleotide that hybridizes under stringent conditions to the complementary strand of the polynucleotide encoding these polypeptides) are also encompassed by the invention. In preferred embodiments, these fragments or variants retain one or more functional activities of the full-length or mature form of the polypeptide (e.g., biological activity (such as, for example, activity useful in detecting, preventing, diagnosing, prognosticating, treating, and/or ameliorating immune disorders), antigenicity (ability to bind, or compete with a polypeptide of the invention for binding, to an anti-polypeptide of the invention antibody), immunogenicity (ability to generate antibody which binds to a specific polypeptide of the invention), ability to form multimers with polypeptides of the invention, and ability to bind to a receptor or ligand for a polypeptide of the invention). Antibodies that bind the polypeptides of the invention, and polynucleotides encoding these polypeptides are also encompassed by the invention.

According to the signal hypothesis, proteins secreted by mammalian cells have a signal or secretory leader sequence that is cleaved from the mature protein once export of the growing protein chain across the rough endoplasmic reticulum has been initiated. Most mammalian cells and even insect cells cleave secreted proteins with the same specificity. However, in some cases, cleavage of a secreted protein is not entirely uniform, which results in two or more mature species of the protein. Further, it has long been known that cleavage specificity of a secreted protein is ultimately determined by the primary structure of the complete protein, that is, it is inherent in the amino acid sequence of the polypeptide.

Methods for predicting whether a protein has a signal sequence, as well as the cleavage point for that sequence, are available. For instance, the method of McGeoch, *Virus Res.* 3:271-286 (1985), uses the information from a short N-terminal charged region and a subsequent uncharged region of the complete (uncleaved) protein. The method of von Heinje, *Nucleic Acids Res.* 14:4683-4690 (1986) uses the information from the residues surrounding the cleavage site, typically residues -13 to +2, where +1 indicates the amino terminus of the secreted protein. The accuracy of predicting the cleavage points of known mammalian secretory proteins for each of these methods is in the range of 75-80%. (von Heinje, *supra.*) However, the two methods do not always produce the same predicted cleavage point(s) for a given protein.

In the present case, the deduced amino acid sequence of the secreted polypeptide was analyzed by a computer program called SignalP (Henrik Nielsen et al., *Protein Engineering* 10:1-6 (1997)), which predicts the cellular location of a protein based on the amino acid sequence. As part of this computational prediction of localization, the methods of McGeoch and von Heinje are incorporated. The analysis of the amino acid sequences of the secreted proteins described herein by this program provided the results shown in Table 1A.

In specific embodiments, polypeptides of the invention comprise, or alternatively consist of, the predicted mature form of the polypeptide as delineated in columns 14 and 15 of Table 1A. Moreover, fragments or variants of these polypeptides (such as, fragments as described herein, polypeptides at least 80%, 85%, 90%, 95%, 96%, 97%, 98%, 99%, or 100% identical to these polypeptides, or polypeptides encoded by a polynucleotide that hybridizes under stringent conditions to the complementary strand of the polynucleotide encoding these polypeptides) are also encompassed by the invention. In preferred embodiments, these fragments or variants retain one or more functional activities of the full-length or mature form of the polypeptide (e.g., biological activity (such as, for example, activity useful in detecting, preventing, diagnosing, prognosticating, treating, and/or ameliorating immune disorders), antigenicity (ability to bind, or compete with a polypeptide of the invention for binding, to an anti-polypeptide of the invention antibody), immunogenicity (ability to generate antibody which binds to a specific polypeptide of the invention), ability to form multimers with polypeptides of the invention, and ability to bind to a receptor or ligand for a polypeptide of the invention). Antibodies that bind the polypeptides of the invention, and polynucleotides encoding these polypeptides are also encompassed by the invention.

Polynucleotides encoding proteins comprising, or consisting of, the predicted mature form of polypeptides of the invention (e.g., polynucleotides having the sequence of SEQ ID NO: X (Table 1A, column 4), the sequence delineated in columns 7 and 8 of Table 1A, and a sequence encoding the mature polypeptide delineated in columns 14 and 15 of Table 1A (e.g., the sequence of SEQ ID NO: X encoding the mature polypeptide delineated in columns 14 and 15 of Table 1)) are also encompassed by the invention, as are fragments or variants of these polynucleotides (such as, fragments as described herein, polynucleotides at least 80%, 85%, 90%, 95%, 96%, 97%, 98%, 99%, or 100% identical to these polynucleotides, and nucleic acids which hybridizes under stringent conditions to the complementary strand of the polynucleotide).

As one of ordinary skill would appreciate, however, cleavage sites sometimes vary from organism to organism and cannot be predicted with absolute certainty. Accordingly, the present invention provides secreted polypeptides having a sequence shown in SEQ ID NO: Y which have an N-terminus beginning within 15 residues of the predicted cleavage point (i.e., having 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, or 15 more or less contiguous residues of SEQ ID NO: Y at the N-terminus when compared to the predicted mature form of the polypeptide (e.g., the mature polypeptide delineated in columns 14 and 15 of Table 1). Similarly, it is also recognized that in some cases, cleavage of the signal sequence from a secreted protein is not entirely uniform, resulting in more than one secreted species. These polypeptides, and the polynucleotides encoding such polypeptides, are contemplated by the present invention.

Moreover, the signal sequence identified by the above analysis may not necessarily predict the naturally occurring signal sequence. For example, the naturally occurring signal sequence may be further upstream from the predicted signal sequence. However, it is likely that the predicted signal sequence will be capable of directing the secreted protein to the ER.

- 5 Nonetheless, the present invention provides the mature protein produced by expression of the polynucleotide sequence of SEQ ID NO:X and/or the polynucleotide sequence contained in the cDNA of a deposited clone, in a mammalian cell (e.g., COS cells, as described below). These polypeptides, and the polynucleotides encoding such polypeptides, are contemplated by the present invention.

10

#### *Polynucleotide and Polypeptide Variants*

- The present invention is also directed to variants of the polynucleotide sequence disclosed in SEQ ID NO:X or the complementary strand thereto, nucleotide sequences encoding the polypeptide of SEQ ID NO:Y, the nucleotide sequence of SEQ ID NO:X that encodes the polypeptide sequence as defined in columns 13 and 14 of Table 1A, nucleotide sequences  
15 encoding the polypeptide sequence as defined in columns 13 and 14 of Table 1A, the nucleotide sequence of SEQ ID NO:X encoding the polypeptide sequence as defined in Table 1B, nucleotide sequences encoding the polypeptide as defined in Table 1B, the nucleotide sequence as defined in columns 8 and 9 of Table 2, nucleotide sequences encoding the polypeptide encoded by the  
20 nucleotide sequence as defined in columns 8 and 9 of Table 2, the nucleotide sequence as defined in column 6 of Table 1C, nucleotide sequences encoding the polypeptide encoded by the nucleotide sequence as defined in column 6 of Table 1C, the cDNA sequence contained in ATCC Deposit No:Z, nucleotide sequences encoding the polypeptide encoded by the cDNA sequence contained in ATCC Deposit No:Z, and/or nucleotide sequences encoding a mature (secreted)  
25 polypeptide encoded by the cDNA sequence contained in ATCC Deposit No:Z.

- The present invention also encompasses variants of the polypeptide sequence disclosed in SEQ ID NO:Y, the polypeptide as defined in columns 13 and 14 of Table 1A, the polypeptide sequence as defined in Table 1B, a polypeptide sequence encoded by the polynucleotide sequence in SEQ ID NO:X, a polypeptide sequence encoded by the nucleotide  
30 sequence as defined in columns 8 and 9 of Table 2, a polypeptide sequence encoded by the nucleotide sequence as defined in column 6 of Table 1C, a polypeptide sequence encoded by the complement of the polynucleotide sequence in SEQ ID NO:X, the polypeptide sequence encoded by the cDNA sequence contained in ATCC Deposit No:Z and/or a mature (secreted) polypeptide encoded by the cDNA sequence contained in ATCC Deposit No:Z.

- 35 "Variant" refers to a polynucleotide or polypeptide differing from the polynucleotide or polypeptide of the present invention, but retaining essential properties thereof. Generally,

variants are overall closely similar, and, in many regions, identical to the polynucleotide or polypeptide of the present invention.

Thus, one aspect of the invention provides an isolated nucleic acid molecule comprising, or alternatively consisting of, a polynucleotide having a nucleotide sequence selected from the group consisting of: (a) a nucleotide sequence described in SEQ ID NO:X or contained in the cDNA sequence of ATCC Deposit No:Z; (b) a nucleotide sequence in SEQ ID NO:X or the cDNA in ATCC Deposit No:Z which encodes the complete amino acid sequence of SEQ ID NO:Y or the complete amino acid sequence encoded by the cDNA in ATCC Deposit No:Z; (c) a nucleotide sequence in SEQ ID NO:X or the cDNA in ATCC Deposit No:Z which encodes a mature polypeptide (i.e., a secreted polypeptide (e.g., as delineated in columns 14 and 15 of Table 1A)); (d) a nucleotide sequence in SEQ ID NO:X or the cDNA sequence of ATCC Deposit No:Z, which encodes a biologically active fragment of a polypeptide; (e) a nucleotide sequence in SEQ ID NO:X or the cDNA sequence of ATCC Deposit No:Z, which encodes an antigenic fragment of a polypeptide; (f) a nucleotide sequence encoding a polypeptide comprising the complete amino acid sequence of SEQ ID NO:Y or the complete amino acid sequence encoded by the cDNA in ATCC Deposit No:Z; (g) a nucleotide sequence encoding a mature polypeptide of the amino acid sequence of SEQ ID NO:Y (i.e., a secreted polypeptide (e.g., as delineated in columns 14 and 15 of Table 1A)) or a mature polypeptide of the amino acid sequence encoded by the cDNA in ATCC Deposit No:Z; (h) a nucleotide sequence encoding a biologically active fragment of a polypeptide having the complete amino acid sequence of SEQ ID NO:Y or the complete amino acid sequence encoded by the cDNA in ATCC Deposit No:Z; (i) a nucleotide sequence encoding an antigenic fragment of a polypeptide having the complete amino acid sequence of SEQ ID NO:Y or the complete amino acid sequence encoded by the cDNA in ATCC Deposit No:Z; and (j) a nucleotide sequence complementary to any of the nucleotide sequences in (a), (b), (c), (d), (e), (f), (g), (h), or (i) above.

The present invention is also directed to nucleic acid molecules which comprise, or alternatively consist of, a nucleotide sequence which is at least 80%, 85%, 90%, 95%, 96%, 97%, 98%, 99% or 100%, identical to, for example, any of the nucleotide sequences in (a), (b), (c), (d), (e), (f), (g), (h), (i), or (j) above, the nucleotide coding sequence in SEQ ID NO:X or the complementary strand thereto, the nucleotide coding sequence of the cDNA contained in ATCC Deposit No:Z or the complementary strand thereto, a nucleotide sequence encoding the polypeptide of SEQ ID NO:Y, a nucleotide sequence encoding a polypeptide sequence encoded by the nucleotide sequence in SEQ ID NO:X, a polypeptide sequence encoded by the complement of the polynucleotide sequence in SEQ ID NO:X, a nucleotide sequence encoding the polypeptide encoded by the cDNA contained in ATCC Deposit No:Z, the nucleotide coding sequence in SEQ ID NO:X as defined in columns 8 and 9 of Table 2 or the complementary strand thereto, a nucleotide sequence encoding the polypeptide encoded by the nucleotide sequence in SEQ ID



NO:X as defined in columns 8 and 9 of Table 2 or the complementary strand thereto, the nucleotide coding sequence in SEQ ID NO:B as defined in column 6 of Table 1C or the complementary strand thereto, a nucleotide sequence encoding the polypeptide encoded by the nucleotide sequence in SEQ ID NO:B as defined in column 6 of Table 1C or the complementary strand thereto, the nucleotide sequence in SEQ ID NO:X encoding the polypeptide sequence as defined in Table 1B or the complementary strand thereto, nucleotide sequences encoding the polypeptide as defined in Table 1B or the complementary strand thereto, and/or polynucleotide fragments of any of these nucleic acid molecules (e.g., those fragments described herein). Polynucleotides which hybridize to the complement of these nucleic acid molecules under stringent hybridization conditions or alternatively, under lower stringency conditions, are also encompassed by the invention, as are polypeptides encoded by these polynucleotides and nucleic acids.

In a preferred embodiment, the invention encompasses nucleic acid molecules which comprise, or alternatively, consist of a polynucleotide which hybridizes under stringent hybridization conditions, or alternatively, under lower stringency conditions, to a polynucleotide in (a), (b), (c), (d), (e), (f), (g), (h), or (i), above, as are polypeptides encoded by these polynucleotides. In another preferred embodiment, polynucleotides which hybridize to the complement of these nucleic acid molecules under stringent hybridization conditions, or alternatively, under lower stringency conditions, are also encompassed by the invention, as are polypeptides encoded by these polynucleotides.

In another embodiment, the invention provides a purified protein comprising, or alternatively consisting of, a polypeptide having an amino acid sequence selected from the group consisting of: (a) the complete amino acid sequence of SEQ ID NO:Y or the complete amino acid sequence encoded by the cDNA in ATCC Deposit No:Z; (b) the amino acid sequence of a mature (secreted) form of a polypeptide having the amino acid sequence of SEQ ID NO:Y (e.g., as delineated in columns 14 and 15 of Table 1A) or a mature form of the amino acid sequence encoded by the cDNA in ATCC Deposit No:Z mature; (c) the amino acid sequence of a biologically active fragment of a polypeptide having the complete amino acid sequence of SEQ ID NO:Y or the complete amino acid sequence encoded by the cDNA in ATCC Deposit No:Z; and (d) the amino acid sequence of an antigenic fragment of a polypeptide having the complete amino acid sequence of SEQ ID NO:Y or the complete amino acid sequence encoded by the cDNA in ATCC Deposit No:Z.

The present invention is also directed to proteins which comprise, or alternatively consist of, an amino acid sequence which is at least 80%, 85%, 90%, 95%, 96%, 97%, 98%, 99% or 100%, identical to, for example, any of the amino acid sequences in (a), (b), (c), or (d), above, the amino acid sequence shown in SEQ ID NO:Y, the amino acid sequence encoded by the cDNA

contained in ATCC Deposit No:Z, the amino acid sequence of the polypeptide encoded by the nucleotide sequence in SEQ ID NO:X as defined in columns 8 and 9 of Table 2, the amino acid sequence of the polypeptide encoded by the nucleotide sequence in SEQ ID NO:B as defined in column 6 of Table 1C, the amino acid sequence as defined in Table 1B, an amino acid sequence  
 5 encoded by the nucleotide sequence in SEQ ID NO:X, and an amino acid sequence encoded by the complement of the polynucleotide sequence in SEQ ID NO:X. Fragments of these polypeptides are also provided (e.g., those fragments described herein). Further proteins encoded by polynucleotides which hybridize to the complement of the nucleic acid molecules encoding these amino acid sequences under stringent hybridization conditions or alternatively, under lower  
 10 stringency conditions, are also encompassed by the invention, as are the polynucleotides encoding these proteins.

By a nucleic acid having a nucleotide sequence at least, for example, 95% "identical" to a reference nucleotide sequence of the present invention, it is intended that the nucleotide sequence of the nucleic acid is identical to the reference sequence except that the nucleotide  
 15 sequence may include up to five point mutations per each 100 nucleotides of the reference nucleotide sequence encoding the polypeptide. In other words, to obtain a nucleic acid having a nucleotide sequence at least 95% identical to a reference nucleotide sequence, up to 5% of the nucleotides in the reference sequence may be deleted or substituted with another nucleotide, or a number of nucleotides up to 5% of the total nucleotides in the reference sequence may be inserted  
 20 into the reference sequence. The query sequence may be an entire sequence referred to in Table 1B or 2 as the ORF (open reading frame), or any fragment specified as described herein.

As a practical matter, whether any particular nucleic acid molecule or polypeptide is at least 80%, 85%, 90%, 95%, 96%, 97%, 98% or 99% identical to a nucleotide sequence of the present invention can be determined conventionally using known computer programs. A preferred  
 25 method for determining the best overall match between a query sequence (a sequence of the present invention) and a subject sequence, also referred to as a global sequence alignment, can be determined using the FASTDB computer program based on the algorithm of Brutlag et al. (Comp. App. Biosci. 6:237-245 (1990)). In a sequence alignment the query and subject sequences are both DNA sequences. An RNA sequence can be compared by converting U's to T's. The result of said  
 30 global sequence alignment is expressed as percent identity. Preferred parameters used in a FASTDB alignment of DNA sequences to calculate percent identity are: Matrix=Unitary, k-tuple=4, Mismatch Penalty=1, Joining Penalty=30, Randomization Group Length=0, Cutoff Score=1, Gap Penalty=5, Gap Size Penalty 0.05, Window Size=500 or the length of the subject nucleotide sequence, whichever is shorter.

35 If the subject sequence is shorter than the query sequence because of 5' or 3' deletions, not because of internal deletions, a manual correction must be made to the results. This

is because the FASTDB program does not account for 5' and 3' truncations of the subject sequence when calculating percent identity. For subject sequences truncated at the 5' or 3' ends, relative to the query sequence, the percent identity is corrected by calculating the number of bases of the query sequence that are 5' and 3' of the subject sequence, which are not matched/aligned, as  
5 a percent of the total bases of the query sequence. Whether a nucleotide is matched/aligned is determined by results of the FASTDB sequence alignment. This percentage is then subtracted from the percent identity, calculated by the above FASTDB program using the specified parameters, to arrive at a final percent identity score. This corrected score is what is used for the purposes of the present invention. Only bases outside the 5' and 3' bases of the subject sequence,  
10 as displayed by the FASTDB alignment, which are not matched/aligned with the query sequence, are calculated for the purposes of manually adjusting the percent identity score.

For example, a 90 base subject sequence is aligned to a 100 base query sequence to determine percent identity. The deletions occur at the 5' end of the subject sequence and therefore, the FASTDB alignment does not show a matched/alignment of the first 10 bases at 5'  
15 end. The 10 unpaired bases represent 10% of the sequence (number of bases at the 5' and 3' ends not matched/total number of bases in the query sequence) so 10% is subtracted from the percent identity score calculated by the FASTDB program. If the remaining 90 bases were perfectly matched the final percent identity would be 90%. In another example, a 90 base subject sequence is compared with a 100 base query sequence. This time the deletions are internal deletions so that  
20 there are no bases on the 5' or 3' of the subject sequence which are not matched/aligned with the query. In this case the percent identity calculated by FASTDB is not manually corrected. Once again, only bases 5' and 3' of the subject sequence which are not matched/aligned with the query sequence are manually corrected for. No other manual corrections are to be made for the purposes of the present invention.

25 By a polypeptide having an amino acid sequence at least, for example, 95% "identical" to a query amino acid sequence of the present invention, it is intended that the amino acid sequence of the subject polypeptide is identical to the query sequence except that the subject polypeptide sequence may include up to five amino acid alterations per each 100 amino acids of the query amino acid sequence. In other words, to obtain a polypeptide having an amino acid  
30 sequence at least 95% identical to a query amino acid sequence, up to 5% of the amino acid residues in the subject sequence may be inserted, deleted, (indels) or substituted with another amino acid. These alterations of the reference sequence may occur at the amino or carboxy terminal positions of the reference amino acid sequence or anywhere between those terminal positions, interspersed either individually among residues in the reference sequence or in one or  
35 more contiguous groups within the reference sequence.

As a practical matter, whether any particular polypeptide is at least 80%, 85%, 90%,

95%, 96%, 97%, 98% or 99% identical to, for instance, the amino acid sequence of a polypeptide referred to in Table 1A (e.g., the amino acid sequence delineated in columns 14 and 15) or a fragment thereof, Table 1B (e.g., the amino acid sequence identified in column 6) or a fragment thereof, Table 2 (e.g., the amino acid sequence of the polypeptide encoded by the polynucleotide sequence defined in columns 8 and 9 of Table 2) or a fragment thereof, the amino acid sequence of the polypeptide encoded by the polynucleotide sequence in SEQ ID NO:B as defined in column 6 of Table 1C or a fragment thereof, the amino acid sequence of the polypeptide encoded by the nucleotide sequence in SEQ ID NO:X or a fragment thereof, or the amino acid sequence of the polypeptide encoded by cDNA contained in ATCC Deposit No:Z, or a fragment thereof, the amino acid sequence of a mature (secreted) polypeptide encoded by cDNA contained in ATCC Deposit No:Z, or a fragment thereof, can be determined conventionally using known computer programs. A preferred method for determining the best overall match between a query sequence (a sequence of the present invention) and a subject sequence, also referred to as a global sequence alignment, can be determined using the FASTDB computer program based on the algorithm of Brutlag et al. (Comp. App. Biosci.6:237-245 (1990)). In a sequence alignment the query and subject sequences are either both nucleotide sequences or both amino acid sequences. The result of said global sequence alignment is expressed as percent identity. Preferred parameters used in a FASTDB amino acid alignment are: Matrix=PAM 0, k-tuple=2, Mismatch Penalty=1, Joining Penalty=20, Randomization Group Length=0, Cutoff Score=1, Window Size=sequence length, Gap Penalty=5, Gap Size Penalty=0.05, Window Size=500 or the length of the subject amino acid sequence, whichever is shorter.

If the subject sequence is shorter than the query sequence due to N- or C-terminal deletions, not because of internal deletions, a manual correction must be made to the results. This is because the FASTDB program does not account for N- and C-terminal truncations of the subject sequence when calculating global percent identity. For subject sequences truncated at the N- and C-termini, relative to the query sequence, the percent identity is corrected by calculating the number of residues of the query sequence that are N- and C-terminal of the subject sequence, which are not matched/aligned with a corresponding subject residue, as a percent of the total bases of the query sequence. Whether a residue is matched/aligned is determined by results of the FASTDB sequence alignment. This percentage is then subtracted from the percent identity, calculated by the above FASTDB program using the specified parameters, to arrive at a final percent identity score. This final percent identity score is what is used for the purposes of the present invention. Only residues to the N- and C-termini of the subject sequence, which are not matched/aligned with the query sequence, are considered for the purposes of manually adjusting the percent identity score. That is, only query residue positions outside the farthest N- and C-terminal residues of the subject sequence.

For example, a 90 amino acid residue subject sequence is aligned with a 100 residue

query sequence to determine percent identity. The deletion occurs at the N-terminus of the subject sequence and therefore, the FASTDB alignment does not show a matching/alignment of the first 10 residues at the N-terminus. The 10 unpaired residues represent 10% of the sequence (number of residues at the N- and C- termini not matched/total number of residues in the query sequence) so 10% is subtracted from the percent identity score calculated by the FASTDB program. If the remaining 90 residues were perfectly matched the final percent identity would be 90%. In another example, a 90 residue subject sequence is compared with a 100 residue query sequence. This time the deletions are internal deletions so there are no residues at the N- or C-termini of the subject sequence which are not matched/aligned with the query. In this case the percent identity calculated by FASTDB is not manually corrected. Once again, only residue positions outside the N- and C-terminal ends of the subject sequence, as displayed in the FASTDB alignment, which are not matched/aligned with the query sequence are manually corrected for. No other manual corrections are to made for the purposes of the present invention.

The polynucleotide variants of the invention may contain alterations in the coding regions, non-coding regions, or both. Especially preferred are polynucleotide variants containing alterations which produce silent substitutions, additions, or deletions, but do not alter the properties or activities of the encoded polypeptide. Nucleotide variants produced by silent substitutions due to the degeneracy of the genetic code are preferred. Moreover, polypeptide variants in which less than 50, less than 40, less than 30, less than 20, less than 10, or 5-50, 5-25, 5-10, 1-5, or 1-2 amino acids are substituted, deleted, or added in any combination are also preferred. Polynucleotide variants can be produced for a variety of reasons, e.g., to optimize codon expression for a particular host (change codons in the human mRNA to those preferred by a bacterial host such as *E. coli*).

Naturally occurring variants are called "allelic variants," and refer to one of several alternate forms of a gene occupying a given locus on a chromosome of an organism. (Genes II, Lewin, B., ed., John Wiley & Sons, New York (1985)). These allelic variants can vary at either the polynucleotide and/or polypeptide level and are included in the present invention. Alternatively, non-naturally occurring variants may be produced by mutagenesis techniques or by direct synthesis.

Using known methods of protein engineering and recombinant DNA technology, variants may be generated to improve or alter the characteristics of the polypeptides of the present invention. For instance, one or more amino acids can be deleted from the N-terminus or C-terminus of the polypeptide of the present invention without substantial loss of biological function. As an example, Ron et al. (*J. Biol. Chem.* 268: 2984-2988 (1993)) reported variant KGF proteins having heparin binding activity even after deleting 3, 8, or 27 amino-terminal amino acid residues. Similarly, Interferon gamma exhibited up to ten times higher activity after deleting 8-10 amino

acid residues from the carboxy terminus of this protein. (Dobeli et al., J. Biotechnology 7:199-216 (1988).)

Moreover, ample evidence demonstrates that variants often retain a biological activity similar to that of the naturally occurring protein. For example, Gayle and coworkers (J. Biol. Chem. 268:22105-22111 (1993)) conducted extensive mutational analysis of human cytokine IL-1a. They used random mutagenesis to generate over 3,500 individual IL-1a mutants that averaged 2.5 amino acid changes per variant over the entire length of the molecule. Multiple mutations were examined at every possible amino acid position. The investigators found that "[m]ost of the molecule could be altered with little effect on either [binding or biological activity]." In fact, only 23 unique amino acid sequences, out of more than 3,500 nucleotide sequences examined, produced a protein that significantly differed in activity from wild-type.

Furthermore, even if deleting one or more amino acids from the N-terminus or C-terminus of a polypeptide results in modification or loss of one or more biological functions, other biological activities may still be retained. For example, the ability of a deletion variant to induce and/or to bind antibodies which recognize the secreted form will likely be retained when less than the majority of the residues of the secreted form are removed from the N-terminus or C-terminus. Whether a particular polypeptide lacking N- or C-terminal residues of a protein retains such immunogenic activities can readily be determined by routine methods described herein and otherwise known in the art.

Thus, the invention further includes polypeptide variants which show a biological or functional activity of the polypeptides of the invention (such as, for example, activity useful in detecting, preventing, diagnosing, prognosticating, treating, and/or ameliorating immune disorders). Such variants include deletions, insertions, inversions, repeats, and substitutions selected according to general rules known in the art so as to have little effect on activity.

The present application is directed to nucleic acid molecules at least 80%, 85%, 90%, 95%, 96%, 97%, 98%, 99% or 100% identical to the nucleic acid sequences disclosed herein, (e.g., encoding a polypeptide having the amino acid sequence of an N and/or C terminal deletion), irrespective of whether they encode a polypeptide having functional activity. This is because even where a particular nucleic acid molecule does not encode a polypeptide having functional activity, one of skill in the art would still know how to use the nucleic acid molecule, for instance, as a hybridization probe or a polymerase chain reaction (PCR) primer. Uses of the nucleic acid molecules of the present invention that do not encode a polypeptide having functional activity include, inter alia, (1) isolating a gene or allelic or splice variants thereof in a cDNA library; (2) in situ hybridization (e.g., "FISH") to metaphase chromosomal spreads to provide precise chromosomal location of the gene, as described in Verma et al., Human Chromosomes: A Manual of Basic Techniques, Pergamon Press, New York (1988); (3) Northern Blot analysis for detecting

mRNA expression in specific tissues (e.g., normal or diseased tissues); and (4) *in situ* hybridization (e.g., histochemistry) for detecting mRNA expression in specific tissues (e.g., normal or diseased tissues).

Preferred, however, are nucleic acid molecules having sequences at least 80%, 85%, 90%, 95%, 96%, 97%, 98%, 99% or 100% identical to the nucleic acid sequences disclosed herein, which do, in fact, encode a polypeptide having functional activity. By a polypeptide having "functional activity" is meant, a polypeptide capable of displaying one or more known functional activities associated with a full-length (complete) protein and/or a mature (secreted) protein of the invention. Such functional activities include, but are not limited to, biological activity (such as, for example, activity useful in detecting, preventing, diagnosing, prognosticating, treating, and/or ameliorating immune diseases and disorders), antigenicity (ability to bind, or compete with a polypeptide of the invention for binding, to an anti-polypeptide of the invention antibody), immunogenicity (ability to generate antibody which binds to a specific polypeptide of the invention), ability to form multimers with polypeptides of the invention, and ability to bind to a receptor or ligand for a polypeptide of the invention.

The functional activity of the polypeptides, and fragments, variants and derivatives of the invention, can be assayed by various methods.

For example, in one embodiment where one is assaying for the ability to bind or compete with a full-length polypeptide of the present invention for binding to an anti-polypeptide antibody, various immunoassays known in the art can be used, including but not limited to, competitive and non-competitive assay systems using techniques such as radioimmunoassays, ELISA (enzyme linked immunosorbent assay), "sandwich" immunoassays, immunoradiometric assays, gel diffusion precipitation reactions, immunodiffusion assays, *in situ* immunoassays (using colloidal gold, enzyme or radioisotope labels, for example), western blots, precipitation reactions, agglutination assays (e.g., gel agglutination assays, hemagglutination assays), complement fixation assays, immunofluorescence assays, protein A assays, and immunoelectrophoresis assays, etc. In one embodiment, antibody binding is detected by detecting a label on the primary antibody. In another embodiment, the primary antibody is detected by detecting binding of a secondary antibody or reagent to the primary antibody. In a further embodiment, the secondary antibody is labeled. Many means are known in the art for detecting binding in an immunoassay and are within the scope of the present invention.

In another embodiment, where a ligand is identified, or the ability of a polypeptide fragment, variant or derivative of the invention to multimerize is being evaluated, binding can be assayed, e.g., by means well-known in the art, such as, for example, reducing and non-reducing gel chromatography, protein affinity chromatography, and affinity blotting. See generally, Phizicky et al., *Microbiol. Rev.* 59:94-123 (1995). In another embodiment, the ability of physiological

correlates of a polypeptide of the present invention to bind to a substrate(s) of the polypeptide of the invention can be routinely assayed using techniques known in the art.

In addition, assays described herein (see Examples) and otherwise known in the art may routinely be applied to measure the ability of polypeptides of the present invention and  
5 fragments, variants and derivatives thereof to elicit polypeptide related biological activity (either *in vitro* or *in vivo*). Other methods will be known to the skilled artisan and are within the scope of the invention.

Of course, due to the degeneracy of the genetic code, one of ordinary skill in the art will immediately recognize that a large number of the nucleic acid molecules having a sequence at  
10 least 80%, 85%, 90%, 95%, 96%, 97%, 98%, 99%, or 100% identical to, for example, the nucleic acid sequence of the cDNA contained in ATCC Deposit No:Z, the nucleic acid sequence referred to in Table 1B (SEQ ID NO:X), the nucleic acid sequence disclosed in Table 1A (e.g., the nucleic acid sequence delineated in columns 7 and 8), the nucleic acid sequence disclosed in Table 2 (e.g., the nucleic acid sequence delineated in columns 8 and 9) or fragments thereof, will encode  
15 polypeptides "having functional activity." In fact, since degenerate variants of any of these nucleotide sequences all encode the same polypeptide, in many instances, this will be clear to the skilled artisan even without performing the above described comparison assay. It will be further recognized in the art that, for such nucleic acid molecules that are not degenerate variants, a reasonable number will also encode a polypeptide having functional activity. This is because the  
20 skilled artisan is fully aware of amino acid substitutions that are either less likely or not likely to significantly effect protein function (e.g., replacing one aliphatic amino acid with a second aliphatic amino acid), as further described below.

For example, guidance concerning how to make phenotypically silent amino acid substitutions is provided in Bowie et al., "Deciphering the Message in Protein Sequences:  
25 Tolerance to Amino Acid Substitutions," Science 247:1306-1310 (1990), wherein the authors indicate that there are two main strategies for studying the tolerance of an amino acid sequence to change.

The first strategy exploits the tolerance of amino acid substitutions by natural selection during the process of evolution. By comparing amino acid sequences in different  
30 species, conserved amino acids can be identified. These conserved amino acids are likely important for protein function. In contrast, the amino acid positions where substitutions have been tolerated by natural selection indicates that these positions are not critical for protein function. Thus, positions tolerating amino acid substitution could be modified while still maintaining biological activity of the protein.

35 The second strategy uses genetic engineering to introduce amino acid changes at specific positions of a cloned gene to identify regions critical for protein function. For example,



site directed mutagenesis or alanine-scanning mutagenesis (introduction of single alanine mutations at every residue in the molecule) can be used. See Cunningham and Wells, *Science* 244:1081-1085 (1989). The resulting mutant molecules can then be tested for biological activity.

As the authors state, these two strategies have revealed that proteins are surprisingly  
5 tolerant of amino acid substitutions. The authors further indicate which amino acid changes are likely to be permissive at certain amino acid positions in the protein. For example, most buried (within the tertiary structure of the protein) amino acid residues require nonpolar side chains, whereas few features of surface side chains are generally conserved. Moreover, tolerated conservative amino acid substitutions involve replacement of the aliphatic or hydrophobic amino  
10 acids Ala, Val, Leu and Ile; replacement of the hydroxyl residues Ser and Thr; replacement of the acidic residues Asp and Glu; replacement of the amide residues Asn and Gln, replacement of the basic residues Lys, Arg, and His; replacement of the aromatic residues Phe, Tyr, and Trp, and replacement of the small-sized amino acids Ala, Ser, Thr, Met, and Gly.

Besides conservative amino acid substitution, variants of the present invention include  
15 (i) substitutions with one or more of the non-conserved amino acid residues, where the substituted amino acid residues may or may not be one encoded by the genetic code, or (ii) substitutions with one or more of the amino acid residues having a substituent group, or (iii) fusion of the mature polypeptide with another compound, such as a compound to increase the stability and/or solubility of the polypeptide (for example, polyethylene glycol), (iv) fusion of the polypeptide with  
20 additional amino acids, such as, for example, an IgG Fc fusion region peptide, serum albumin (preferably human serum albumin) or a fragment thereof, or leader or secretory sequence, or a sequence facilitating purification, or (v) fusion of the polypeptide with another compound, such as albumin (including but not limited to recombinant albumin (see, e.g., U.S. Patent No. 5,876,969, issued March 2, 1999, EP Patent 0 413 622, and U.S. Patent No. 5,766,883, issued June 16, 1998,  
25 herein incorporated by reference in their entirety)). Such variant polypeptides are deemed to be within the scope of those skilled in the art from the teachings herein.

For example, polypeptide variants containing amino acid substitutions of charged amino acids with other charged or neutral amino acids may produce proteins with improved characteristics, such as less aggregation. Aggregation of pharmaceutical formulations both  
30 reduces activity and increases clearance due to the aggregate's immunogenic activity. See Pinckard et al., *Clin. Exp. Immunol.* 2:331-340 (1967); Robbins et al., *Diabetes* 36: 838-845 (1987); Cleland et al., *Crit. Rev. Therapeutic Drug Carrier Systems* 10:307-377 (1993).

A further embodiment of the invention relates to polypeptides which comprise the amino acid sequence of a polypeptide having an amino acid sequence which contains at least one  
35 amino acid substitution, but not more than 50 amino acid substitutions, even more preferably, not more than 40 amino acid substitutions, still more preferably, not more than 30 amino acid

substitutions, and still even more preferably, not more than 20 amino acid substitutions from a polypeptide sequence disclosed herein. Of course it is highly preferable for a polypeptide to have an amino acid sequence which, for example, comprises the amino acid sequence of a polypeptide of SEQ ID NO:Y, the amino acid sequence of the mature (e.g., secreted) polypeptide of SEQ ID NO:Y, an amino acid sequence encoded by SEQ ID NO:X, an amino acid sequence encoded by the portion of SEQ ID NO:X as defined in columns 8 and 9 of Table 2, an amino acid sequence encoded by the complement of SEQ ID NO:X, an amino acid sequence encoded by cDNA contained in ATCC Deposit No:Z, and/or the amino acid sequence of a mature (secreted) polypeptide encoded by cDNA contained in ATCC Deposit No:Z, or a fragment thereof, which contains, in order of ever-increasing preference, at least one, but not more than 10, 9, 8, 7, 6, 5, 4, 3, 2 or 1 amino acid substitutions.

In specific embodiments, the polypeptides of the invention comprise, or alternatively, consist of, fragments or variants of a reference amino acid sequence selected from: (a) the amino acid sequence of SEQ ID NO:Y or fragments thereof (e.g., the mature form and/or other fragments described herein); (b) the amino acid sequence encoded by SEQ ID NO:X or fragments thereof; (c) the amino acid sequence encoded by the complement of SEQ ID NO:X or fragments thereof; (d) the amino acid sequence encoded by the portion of SEQ ID NO:X as defined in columns 8 and 9 of Table 2 or fragments thereof; and (e) the amino acid sequence encoded by cDNA contained in ATCC Deposit No:Z or fragments thereof; wherein the fragments or variants have 1-5, 5-10, 5-25, 5-50, 10-50 or 50-150, amino acid residue additions, substitutions, and/or deletions when compared to the reference amino acid sequence. In preferred embodiments, the amino acid substitutions are conservative. Polynucleotides encoding these polypeptides are also encompassed by the invention.

#### 25 *Polynucleotide and Polypeptide Fragments*

The present invention is also directed to polynucleotide fragments of the polynucleotides (nucleic acids) of the invention. In the present invention, a "polynucleotide fragment" refers to a polynucleotide having a nucleic acid sequence which, for example: is a portion of the cDNA contained in ATCC Deposit No:Z or the complementary strand thereto; is a portion of the polynucleotide sequence encoding the polypeptide encoded by the cDNA contained in ATCC Deposit No:Z or the complementary strand thereto; is a portion of the polynucleotide sequence encoding the mature (secreted) polypeptide encoded by the cDNA contained in ATCC Deposit No:Z or the complementary strand thereto; is a portion of a polynucleotide sequence encoding the mature amino acid sequence as defined in columns 14 and 15 of Table 1A or the complementary strand thereto; is a portion of a polynucleotide sequence encoding the amino acid sequence encoded by the region of SEQ ID NO:X as defined in columns 8 and 9 of Table 2 or the complementary strand thereto; is a portion of the polynucleotide sequence of SEQ ID NO:X as

defined in columns 8 and 9 of Table 2 or the complementary strand thereto; is a portion of the polynucleotide sequence in SEQ ID NO:X or the complementary strand thereto; is a polynucleotide sequence encoding a portion of the polypeptide of SEQ ID NO:Y; is a polynucleotide sequence encoding a portion of a polypeptide encoded by SEQ ID NO:X; is a polynucleotide sequence encoding a portion of a polypeptide encoded by the complement of the polynucleotide sequence in SEQ ID NO:X; is a portion of a polynucleotide sequence encoding the amino acid sequence encoded by the region of SEQ ID NO:B as defined in column 6 of Table 1C or the complementary strand thereto; or is a portion of the polynucleotide sequence of SEQ ID NO:B as defined in column 6 of Table 1C or the complementary strand thereto.

The polynucleotide fragments of the invention are preferably at least about 15 nt, and more preferably at least about 20 nt, still more preferably at least about 30 nt, and even more preferably, at least about 40 nt, at least about 50 nt, at least about 75 nt, or at least about 150 nt in length. A fragment "at least 20 nt in length," for example, is intended to include 20 or more contiguous bases from the cDNA sequence contained in ATCC Deposit No:Z, or the nucleotide sequence shown in SEQ ID NO:X or the complementary stand thereto. In this context "about" includes the particularly recited value or a value larger or smaller by several (5, 4, 3, 2, or 1) nucleotides, at either terminus or at both termini. These nucleotide fragments have uses that include, but are not limited to, as diagnostic probes and primers as discussed herein. Of course, larger fragments (e.g., at least 160, 170, 180, 190, 200, 250, 500, 600, 1000, or 2000 nucleotides in length ) are also encompassed by the invention.

Moreover, representative examples of polynucleotide fragments of the invention comprise, or alternatively consist of, a sequence from about nucleotide number 1-50, 51-100, 101-150, 151-200, 201-250, 251-300, 301-350, 351-400, 401-450, 451-500, 501-550, 551-600, 601-650, 651-700, 701-750, 751-800, 801-850, 851-900, 901-950, 951-1000, 1001-1050, 1051-1100, 1101-1150, 1151-1200, 1201-1250, 1251-1300, 1301-1350, 1351-1400, 1401-1450, 1451-1500, 1501-1550, 1551-1600, 1601-1650, 1651-1700, 1701-1750, 1751-1800, 1801-1850, 1851-1900, 1901-1950, 1951-2000, 2001-2050, 2051-2100, 2101-2150, 2151-2200, 2201-2250, 2251-2300, 2301-2350, 2351-2400, 2401-2450, 2451-2500, 2501-2550, 2551-2600, 2601-2650, 2651-2700, 2701-2750, 2751-2800, 2801-2850, 2851-2900, 2901-2950, 2951-3000, 3001-3050, 3051-3100, 3101-3150, 3151-3200, 3201-3250, 3251-3300, 3301-3350, 3351-3400, 3401-3450, 3451-3500, 3501-3550, 3551-3600, 3601-3650, 3651-3700, 3701-3750, 3751-3800, 3801-3850, 3851-3900, 3901-3950, 3951-4000, 4001-4050, 4051-4100, 4101-4150, 4151-4200, 4201-4250, 4251-4300, 4301-4350, 4351-4400, 4401-4450, 4451-4500, 4501-4550, 4551-4600, 4601-4650, 4651-4700, 4701-4750, 4751-4800, 4801-4850, 4851-4900, 4901-4950, 4951-5000, 5001-5050, 5051-5100, 5101-5150, 5151-5200, 5201-5250, 5251-5300, 5301-5350, 5351-5400, 5401-5450, 5451-5500, 5501-5550, 5551-5600, 5601-5650, 5651-5700, 5701-5750, 5751-5800, 5801-5850, 5851-5900, 5901-5950, 5951-6000, 6001-6050, 6051-6100, 6101-6150, 6151-6200, 6201-6250, 6251-6300,

6301-6350, 6351-6400, 6401-6450, 6451-6500, 6501-6550, 6551-6600, 6601-6650, 6651-6700, 6701-6750, 6751-6800, 6801-6850, 6851-6900, 6901-6950, 6951-7000, 7001-7050, 7051-7100, 7101-7150, 7151-7200, 7201-7250, 7251-7300 or 7301 to the end of SEQ ID NO:X, or the complementary strand thereto. In this context "about" includes the particularly recited range or a  
 5 range larger or smaller by several (5, 4, 3, 2, or 1) nucleotides, at either terminus or at both termini. Preferably, these fragments encode a polypeptide which has a functional activity (e.g., biological activity; such as, for example, activity useful in detecting, preventing, diagnosing, prognosticating, treating, and/or ameliorating immune diseases and disorders). More preferably, these polynucleotides can be used as probes or primers as discussed herein. Polynucleotides  
 10 which hybridize to one or more of these polynucleotides under stringent hybridization conditions or alternatively, under lower stringency conditions are also encompassed by the invention, as are polypeptides encoded by these polynucleotides.

Further representative examples of polynucleotide fragments of the invention comprise, or alternatively consist of, a sequence from about nucleotide number 1-50, 51-100, 101-  
 15 150, 151-200, 201-250, 251-300, 301-350, 351-400, 401-450, 451-500, 501-550, 551-600, 601-650, 651-700, 701-750, 751-800, 801-850, 851-900, 901-950, 951-1000, 1001-1050, 1051-1100, 1101-1150, 1151-1200, 1201-1250, 1251-1300, 1301-1350, 1351-1400, 1401-1450, 1451-1500, 1501-1550, 1551-1600, 1601-1650, 1651-1700, 1701-1750, 1751-1800, 1801-1850, 1851-1900, 1901-1950, 1951-2000, 2001-2050, 2051-2100, 2101-2150, 2151-2200, 2201-2250, 2251-2300,  
 20 2301-2350, 2351-2400, 2401-2450, 2451-2500, 2501-2550, 2551-2600, 2601-2650, 2651-2700, 2701-2750, 2751-2800, 2801-2850, 2851-2900, 2901-2950, 2951-3000, 3001-3050, 3051-3100, 3101-3150, 3151-3200, 3201-3250, 3251-3300, 3301-3350, 3351-3400, 3401-3450, 3451-3500, 3501-3550, 3551-3600, 3601-3650, 3651-3700, 3701-3750, 3751-3800, 3801-3850, 3851-3900, 3901-3950, 3951-4000, 4001-4050, 4051-4100, 4101-4150, 4151-4200, 4201-4250, 4251-4300,  
 25 4301-4350, 4351-4400, 4401-4450, 4451-4500, 4501-4550, 4551-4600, 4601-4650, 4651-4700, 4701-4750, 4751-4800, 4801-4850, 4851-4900, 4901-4950, 4951-5000, 5001-5050, 5051-5100, 5101-5150, 5151-5200, 5201-5250, 5251-5300, 5301-5350, 5351-5400, 5401-5450, 5451-5500, 5501-5550, 5551-5600, 5601-5650, 5651-5700, 5701-5750, 5751-5800, 5801-5850, 5851-5900, 5901-5950, 5951-6000, 6001-6050, 6051-6100, 6101-6150, 6151-6200, 6201-6250, 6251-6300,  
 30 6301-6350, 6351-6400, 6401-6450, 6451-6500, 6501-6550, 6551-6600, 6601-6650, 6651-6700, 6701-6750, 6751-6800, 6801-6850, 6851-6900, 6901-6950, 6951-7000, 7001-7050, 7051-7100, 7101-7150, 7151-7200, 7201-7250, 7251-7300 or 7301 to the end of the cDNA sequence contained in ATCC Deposit No:Z, or the complementary strand thereto. In this context "about" includes the particularly recited range or a range larger or smaller by several (5, 4, 3, 2, or 1)  
 35 nucleotides, at either terminus or at both termini. Preferably, these fragments encode a polypeptide which has a functional activity (e.g., biological activity). More preferably, these polynucleotides can be used as probes or primers as discussed herein. Polynucleotides which hybridize to one or

more of these polynucleotides under stringent hybridization conditions or alternatively, under lower stringency conditions are also encompassed by the invention, as are polypeptides encoded by these polynucleotides.

Moreover, representative examples of polynucleotide fragments of the invention  
5 comprise, or alternatively consist of, a nucleic acid sequence comprising one, two, three, four, five, six, seven, eight, nine, ten, or more of the above described polynucleotide fragments of the invention in combination with a polynucleotide sequence delineated in Table 1C column 6. Additional, representative examples of polynucleotide fragments of the invention comprise, or alternatively consist of, a nucleic acid sequence comprising one, two, three, four, five, six, seven,  
10 eight, nine, ten, or more of the above described polynucleotide fragments of the invention in combination with a polynucleotide sequence that is the complementary strand of a sequence delineated in column 6 of Table 1C. In further embodiments, the above-described polynucleotide fragments of the invention comprise, or alternatively consist of, sequences delineated in Table 1C, column 6, and have a nucleic acid sequence which is different from that of the BAC fragment  
15 having the sequence disclosed in SEQ ID NO:B (see Table 1C, column 5). In additional embodiments, the above-described polynucleotide fragments of the invention comprise, or alternatively consist of, sequences delineated in Table 1C, column 6, and have a nucleic acid sequence which is different from that published for the BAC clone identified as BAC ID NO:A (see Table 1C, column 4). In additional embodiments, the above-described polynucleotides of the  
20 invention comprise, or alternatively consist of, sequences delineated Table 1C, column 6, and have a nucleic acid sequence which is different from that contained in the BAC clone identified as BAC ID NO:A (see Table 1C, column 4). Polypeptides encoded by these polynucleotides, other polynucleotides that encode these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention. Additionally, fragments and variants of the above-described  
25 polynucleotides and polypeptides are also encompassed by the invention.

In additional specific embodiments, polynucleotides of the invention comprise, or alternatively consist of, one, two, three, four, five, six, seven, eight, nine, ten, or more fragments of the sequences delineated in column 6 of Table 1C, and the polynucleotide sequence of SEQ ID NO:X (e.g., as defined in Table 1C, column 2) or fragments or variants thereof. Polypeptides  
30 encoded by these polynucleotides, other polynucleotides that encode these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention.

In additional specific embodiments, polynucleotides of the invention comprise, or alternatively consist of, one, two, three, four, five, six, seven, eight, nine, ten, or more fragments of the sequences delineated in column 6 of Table 1C which correspond to the same ATCC Deposit  
35 No:Z (see Table 1C, column 1), and the polynucleotide sequence of SEQ ID NO:X (e.g., as defined in Table 1A, 1B, or 1C) or fragments or variants thereof. Polypeptides encoded by these

polynucleotides, other polynucleotides that encode these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention.

5 In further specific embodiments, polynucleotides of the invention comprise, or alternatively consist of, one, two, three, four, five, six, seven, eight, nine, ten, or more fragments of the sequences delineated in the same row of column 6 of Table 1C, and the polynucleotide sequence of SEQ ID NO:X (e.g., as defined in Table 1A, 1B, or 1C) or fragments or variants thereof. Polypeptides encoded by these polynucleotides, other polynucleotides that encode these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention.

10 In additional specific embodiments, polynucleotides of the invention comprise, or alternatively consist of a polynucleotide sequence in which the 3' 10 polynucleotides of one of the sequences delineated in column 6 of Table 1C and the 5' 10 polynucleotides of the sequence of SEQ ID NO:X are directly contiguous. Nucleic acids which hybridize to the complement of these 20 contiguous polynucleotides under stringent hybridization conditions or alternatively, under lower stringency conditions, are also encompassed by the invention. Polypeptides encoded by  
15 these polynucleotides and/or nucleic acids, other polynucleotides and/or nucleic acids that encode these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention. Additionally, fragments and variants of the above-described polynucleotides, nucleic acids, and polypeptides are also encompassed by the invention.

20 In additional specific embodiments, polynucleotides of the invention comprise, or alternatively consist of a polynucleotide sequence in which the 3' 10 polynucleotides of one of the sequences delineated in column 6 of Table 1C and the 5' 10 polynucleotides of a fragment or variant of the sequence of SEQ ID NO:X (e.g., as described herein) are directly contiguous. Nucleic acids which hybridize to the complement of these 20 contiguous polynucleotides under stringent hybridization conditions or alternatively, under lower stringency conditions, are also  
25 encompassed by the invention. Polypeptides encoded by these polynucleotides and/or nucleic acids, other polynucleotides and/or nucleic acids encoding these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention. Additionally, fragments and variants of the above-described polynucleotides, nucleic acids, and polypeptides are also encompassed by the invention.

30 In further specific embodiments, polynucleotides of the invention comprise, or alternatively consist of a polynucleotide sequence in which the 3' 10 polynucleotides of a fragment or variant of the sequence of SEQ ID NO:X and the 5' 10 polynucleotides of the sequence of one of the sequences delineated in column 6 of Table 1C are directly contiguous. Nucleic acids which hybridize to the complement of these 20 contiguous polynucleotides under stringent hybridization  
35 conditions or alternatively, under lower stringency conditions, are also encompassed by the invention. Polypeptides encoded by these polynucleotides and/or nucleic acids, other

polynucleotides and/or nucleic acids encoding these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention. Additionally, fragments and variants of the above-described polynucleotides, nucleic acids, and polypeptides are also encompassed by the invention.

5 In specific embodiments, polynucleotides of the invention comprise, or alternatively consist of a polynucleotide sequence in which the 3' 10 polynucleotides of one of the sequences delineated in column 6 of Table 1C and the 5' 10 polynucleotides of another sequence in column 6 are directly contiguous. In preferred embodiments, the 3' 10 polynucleotides of one of the sequences delineated in column 6 of Table 1C is directly contiguous with the 5' 10  
10 polynucleotides of the next sequential exon delineated in Table 1C, column 6. Nucleic acids which hybridize to the complement of these 20 contiguous polynucleotides under stringent hybridization conditions or alternatively, under lower stringency conditions, are also encompassed by the invention. Polypeptides encoded by these polynucleotides and/or nucleic acids, other polynucleotides and/or nucleic acids encoding these polypeptides, and antibodies that bind these  
15 polypeptides are also encompassed by the invention. Additionally, fragments and variants of the above-described polynucleotides, nucleic acids, and polypeptides are also encompassed by the invention.

In the present invention, a "polypeptide fragment" refers to an amino acid sequence which is a portion of the amino acid sequence contained in SEQ ID NO:Y, is a portion of the  
20 mature form of SEQ ID NO:Y as defined in columns 14 and 15 of Table 1A, a portion of an amino acid sequence encoded by the portion of SEQ ID NO:X as defined in columns 8 and 9 of Table 2, is a portion of an amino acid sequence encoded by the polynucleotide sequence of SEQ ID NO:X, is a portion of an amino acid sequence encoded by the complement of the polynucleotide sequence in SEQ ID NO:X, is a portion of the amino acid sequence of a mature (secreted) polypeptide  
25 encoded by the cDNA contained in ATCC Deposit No:Z, and/or is a portion of an amino acid sequence encoded by the cDNA contained in ATCC Deposit No:Z. Protein (polypeptide) fragments may be "free-standing," or comprised within a larger polypeptide of which the fragment forms a part or region, most preferably as a single continuous region. Representative examples of polypeptide fragments of the invention, include, for example, fragments comprising, or  
30 alternatively consisting of, from about amino acid number 1-20, 21-40, 41-60, 61-80, 81-100, 101-120, 121-140, 141-160, 161-180, 181-200, 201-220, 221-240, 241-260, 261-280, 281-300, 301-320, 321-340, 341-360, 361-380, 381-400, 401-420, 421-440, 441-460, 461-480, 481-500, 501-520, 521-540, 541-560, 561-580, 581-600, 601-620, 621-640, 641-660, 661-680, 681-700, 701-720, 721-740, 741-760, 761-780, 781-800, 801-820, 821-840, 841-860, 861-880, 881-900, 901-920, 921-940, 941-960, 961-980, 981-1000, 1001-1020, 1021-1040, 1041-1060, 1061-1080, 1081-1100, 1101-1120, 1121-1140, 1141-1160, 1161-1180, 1181-1200, 1201-1220, 1221-1240, 1241-1260, 1261-1280, 1281-1300, 1301-1320, 1321-1340, 1341-1360, 1361-1380, 1381-1400, 1401-

1420, 1421-1440, or 1441 to the end of the coding region of cDNA and SEQ ID NO: Y. In a preferred embodiment, polypeptide fragments of the invention include, for example, fragments comprising, or alternatively consisting of, from about amino acid number 1-20, 21-40, 41-60, 61-80, 81-100, 101-120, 121-140, 141-160, 161-180, 181-200, 201-220, 221-240, 241-260, 261-280, 281-300, 301-320, 321-340, 341-360, 361-380, 381-400, 401-420, 421-440, 441-460, 461-480, 481-500, 501-520, 521-540, 541-560, 561-580, 581-600, 601-620, 621-640, 641-660, 661-680, 681-700, 701-720, 721-740, 741-760, 761-780, 781-800, 801-820, 821-840, 841-860, 861-880, 881-900, 901-920, 921-940, 941-960, 961-980, 981-1000, 1001-1020, 1021-1040, 1041-1060, 1061-1080, 1081-1100, 1101-1120, 1121-1140, 1141-1160, 1161-1180, 1181-1200, 1201-1220, 1221-1240, 1241-1260, 1261-1280, 1281-1300, 1301-1320, 1321-1340, 1341-1360, 1361-1380, 1381-1400, 1401-1420, 1421-1440, or 1441 to the end of the coding region of SEQ ID NO: Y. Moreover, polypeptide fragments of the invention may be at least about 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 100, 110, 120, 130, 140, or 150 amino acids in length. In this context "about" includes the particularly recited ranges or values, or ranges or values larger or smaller by several (5, 4, 3, 2, or 1) amino acids, at either extreme or at both extremes. Polynucleotides encoding these polypeptide fragments are also encompassed by the invention.

Even if deletion of one or more amino acids from the N-terminus of a protein results in modification or loss of one or more biological functions of the protein, other functional activities (e.g., biological activities; such as, for example, activity useful in detecting, preventing, diagnosing, prognosticating, treating, and/or ameliorating immune diseases and disorders; ability to multimerize; ability to bind a ligand; antigenic ability useful for production of polypeptide specific antibodies) may still be retained. For example, the ability of shortened muteins to induce and/or bind to antibodies which recognize the complete or mature forms of the polypeptides generally will be retained when less than the majority of the residues of the complete or mature polypeptide are removed from the N-terminus. Whether a particular polypeptide lacking N-terminal residues of a complete polypeptide retains such immunologic activities can readily be determined by routine methods described herein and otherwise known in the art. It is not unlikely that a mutein with a large number of deleted N-terminal amino acid residues may retain some biological or immunogenic activities. In fact, peptides composed of as few as six amino acid residues may often evoke an immune response.

Accordingly, polypeptide fragments include the secreted protein as well as the mature form. Further preferred polypeptide fragments include the secreted protein or the mature form having a continuous series of deleted residues from the amino or the carboxy terminus, or both. For example, any number of amino acids, ranging from 1-60, can be deleted from the amino terminus of either the secreted polypeptide or the mature form. Similarly, any number of amino acids, ranging from 1-30, can be deleted from the carboxy terminus of the secreted protein or



mature form. Furthermore, any combination of the above amino and carboxy terminus deletions are preferred. Similarly, polynucleotides encoding these polypeptide fragments are also preferred.

The present invention further provides polypeptides having one or more residues deleted from the amino terminus of the amino acid sequence of a polypeptide disclosed herein (e.g., a polypeptide of SEQ ID NO:Y, a polypeptide as defined in columns 14 and 15 of Table 1A, a polypeptide encoded by the polynucleotide sequence contained in SEQ ID NO:X or the complement thereof, a polypeptide encoded by the portion of SEQ ID NO:X as defined in columns 8 and 9 of Table 2, a polypeptide encoded by the portion of SEQ ID NO:B as defined in column 6 of Table 1C, a polypeptide encoded by the cDNA contained in ATCC Deposit No:Z, and/or a mature polypeptide encoded by the cDNA contained in ATCC Deposit No:Z). In particular, N-terminal deletions may be described by the general formula m-q, where q is a whole integer representing the total number of amino acid residues in a polypeptide of the invention (e.g., the polypeptide disclosed in SEQ ID NO:Y, the mature (secreted) portion of SEQ ID NO:Y as defined in columns 14 and 15 of Table 1A, or the polypeptide encoded by the portion of SEQ ID NO:X as defined in columns 8 and 9 of Table 2), and m is defined as any integer ranging from 2 to q-6. Polynucleotides encoding these polypeptides are also encompassed by the invention.

The present invention further provides polypeptides having one or more residues from the carboxy terminus of the amino acid sequence of a polypeptide disclosed herein (e.g., a polypeptide of SEQ ID NO:Y, the mature (secreted) portion of SEQ ID NO:Y as defined in columns 14 and 15 of Table 1A, a polypeptide encoded by the polynucleotide sequence contained in SEQ ID NO:X, a polypeptide encoded by the portion of SEQ ID NO:X as defined in columns 8 and 9 of Table 2, a polypeptide encoded by the portion of SEQ ID NO:B as defined in column 6 of Table 1C, a polypeptide encoded by the cDNA contained in ATCC Deposit No:Z, and/or a mature polypeptide encoded by the cDNA contained in ATCC Deposit No:Z). In particular, C-terminal deletions may be described by the general formula 1-n, where n is any whole integer ranging from 6 to q-1, and where n corresponds to the position of amino acid residue in a polypeptide of the invention. Polynucleotides encoding these polypeptides are also encompassed by the invention.

In addition, any of the above described N- or C-terminal deletions can be combined to produce a N- and C-terminal deleted polypeptide. The invention also provides polypeptides having one or more amino acids deleted from both the amino and the carboxyl termini, which may be described generally as having residues m-n of a polypeptide encoded by SEQ ID NO:X (e.g., including, but not limited to, the preferred polypeptide disclosed as SEQ ID NO:Y, the mature (secreted) portion of SEQ ID NO:Y as defined in columns 14 and 15 of Table 1A, and the polypeptide encoded by the portion of SEQ ID NO:X as defined in columns 8 and 9 of Table 2), the cDNA contained in ATCC Deposit No:Z, and/or the complement thereof, where n and m are

integers as described above. Polynucleotides encoding these polypeptides are also encompassed by the invention.

Also as mentioned above, even if deletion of one or more amino acids from the C-terminus of a protein results in modification or loss of one or more biological functions of the protein, other functional activities (e.g., biological activities such as, for example, activity useful in  
5 detecting, preventing, diagnosing, prognosticating, treating, and/or ameliorating immune diseases and disorders; ability to multimerize; ability to bind a ligand; antigenic ability useful for production of polypeptide specific antibodies) may still be retained. For example the ability of the shortened mutein to induce and/or bind to antibodies which recognize the complete or mature  
10 forms of the polypeptide generally will be retained when less than the majority of the residues of the complete or mature polypeptide are removed from the C-terminus. Whether a particular polypeptide lacking C-terminal residues of a complete polypeptide retains such immunologic activities can readily be determined by routine methods described herein and otherwise known in the art. It is not unlikely that a mutein with a large number of deleted C-terminal amino acid  
15 residues may retain some biological or immunogenic activities. In fact, peptides composed of as few as six amino acid residues may often evoke an immune response.

The present application is also directed to proteins containing polypeptides at least 80%, 85%, 90%, 95%, 96%, 97%, 98% or 99% identical to a polypeptide sequence set forth herein. In preferred embodiments, the application is directed to proteins containing polypeptides  
20 at least 80%, 85%, 90%, 95%, 96%, 97%, 98% or 99% identical to polypeptides having the amino acid sequence of the specific N- and C-terminal deletions. Polynucleotides encoding these polypeptides are also encompassed by the invention.

Any polypeptide sequence encoded by, for example, the polynucleotide sequences set forth as SEQ ID NO:X or the complement thereof, (presented, for example, in Tables 1A and 2),  
25 the cDNA contained in ATCC Deposit No:Z, or the polynucleotide sequence as defined in column 6 of Table 1C, may be analyzed to determine certain preferred regions of the polypeptide. For example, the amino acid sequence of a polypeptide encoded by a polynucleotide sequence of SEQ ID NO:X (e.g., the polypeptide of SEQ ID NO:Y and the polypeptide encoded by the portion of SEQ ID NO:X as defined in columns 8 and 9 of Table 2) or the cDNA contained in ATCC  
30 Deposit No:Z may be analyzed using the default parameters of the DNASTAR computer algorithm (DNASTAR, Inc., 1228 S. Park St., Madison, WI 53715 USA; <http://www.dnastar.com/>).

Polypeptide regions that may be routinely obtained using the DNASTAR computer algorithm include, but are not limited to, Garnier-Robson alpha-regions, beta-regions,  
35 turn-regions, and coil-regions; Chou-Fasman alpha-regions, beta-regions, and turn-regions; Kyte-Doolittle hydrophilic regions and hydrophobic regions; Eisenberg alpha- and

beta-amphipathic regions; Karplus-Schulz flexible regions; Emini surface-forming regions; and Jameson-Wolf regions of high antigenic index. Among highly preferred polynucleotides of the invention in this regard are those that encode polypeptides comprising regions that combine several structural features, such as several (e.g., 1, 2, 3 or 4) of the features set out above.

5           Additionally, Kyte-Doolittle hydrophilic regions and hydrophobic regions, Emini surface-forming regions, and Jameson-Wolf regions of high antigenic index (i.e., containing four or more contiguous amino acids having an antigenic index of greater than or equal to 1.5, as identified using the default parameters of the Jameson-Wolf program) can routinely be used to determine polypeptide regions that exhibit a high degree of potential for antigenicity. Regions of  
10           high antigenicity are determined from data by DNASTAR analysis by choosing values which represent regions of the polypeptide which are likely to be exposed on the surface of the polypeptide in an environment in which antigen recognition may occur in the process of initiation of an immune response.

            Preferred polypeptide fragments of the invention are fragments comprising, or  
15           alternatively, consisting of, an amino acid sequence that displays a functional activity (e.g. biological activity such as, for example, activity useful in detecting, preventing, diagnosing, prognosticating, treating, and/or ameliorating immune diseases and disorders; ability to multimerize; ability to bind a ligand; antigenic ability useful for production of polypeptide specific antibodies) of the polypeptide sequence of which the amino acid sequence is a fragment. By a  
20           polypeptide displaying a "functional activity" is meant a polypeptide capable of one or more known functional activities associated with a full-length protein, such as, for example, biological activity, antigenicity, immunogenicity, and/or multimerization, as described herein.

            Other preferred polypeptide fragments are biologically active fragments. Biologically active fragments are those exhibiting activity similar, but not necessarily identical, to an activity of  
25           the polypeptide of the present invention. The biological activity of the fragments may include an improved desired activity, or a decreased undesirable activity.

            In preferred embodiments, polypeptides of the invention comprise, or alternatively consist of, one, two, three, four, five or more of the antigenic fragments of the polypeptide of SEQ ID NO:Y, or portions thereof. Polynucleotides encoding these polypeptides are also encompassed  
30           by the invention.

#### *Epitopes and Antibodies*

            The present invention encompasses polypeptides comprising, or alternatively consisting of, an epitope of: the polypeptide sequence shown in SEQ ID NO:Y; a polypeptide  
35           sequence encoded by SEQ ID NO:X or the complementary strand thereto; the polypeptide sequence encoded by the portion of SEQ ID NO:X as defined in columns 8 and 9 of Table 2; the

polypeptide sequence encoded by the portion of SEQ ID NO:B as defined in column 6 of Table 1C or the complement thereto; the polypeptide sequence encoded by the cDNA contained in ATCC Deposit No:Z; or the polypeptide sequence encoded by a polynucleotide that hybridizes to the sequence of SEQ ID NO:X, the complement of the sequence of SEQ ID NO:X, the complement of  
5 a portion of SEQ ID NO:X as defined in columns 8 and 9 of Table 2, or the cDNA sequence contained in ATCC Deposit No:Z under stringent hybridization conditions or alternatively, under lower stringency hybridization as defined *supra*. The present invention further encompasses polynucleotide sequences encoding an epitope of a polypeptide sequence of the invention (such as, for example, the sequence disclosed in SEQ ID NO:X, or a fragment thereof), polynucleotide  
10 sequences of the complementary strand of a polynucleotide sequence encoding an epitope of the invention, and polynucleotide sequences which hybridize to the complementary strand under stringent hybridization conditions or alternatively, under lower stringency hybridization conditions defined *supra*.

The term "epitopes," as used herein, refers to portions of a polypeptide having  
15 antigenic or immunogenic activity in an animal, preferably a mammal, and most preferably in a human. In a preferred embodiment, the present invention encompasses a polypeptide comprising an epitope, as well as the polynucleotide encoding this polypeptide. An "immunogenic epitope," as used herein, is defined as a portion of a protein that elicits an antibody response in an animal, as determined by any method known in the art, for example, by the methods for generating antibodies  
20 described *infra*. (See, for example, Geysen et al., Proc. Natl. Acad. Sci. USA 81:3998- 4002 (1983)). The term "antigenic epitope," as used herein, is defined as a portion of a protein to which an antibody can immunospecifically bind its antigen as determined by any method well known in the art, for example, by the immunoassays described herein. Immunospecific binding excludes non-specific binding but does not necessarily exclude cross- reactivity with other antigens.  
25 Antigenic epitopes need not necessarily be immunogenic.

Fragments which function as epitopes may be produced by any conventional means. (See, e.g., Houghten, R. A., Proc. Natl. Acad. Sci. USA 82:5131-5135 (1985) further described in U.S. Patent No. 4,631,211.)

In the present invention, antigenic epitopes preferably contain a sequence of at least 4,  
30 at least 5, at least 6, at least 7, more preferably at least 8, at least 9, at least 10, at least 11, at least 12, at least 13, at least 14, at least 15, at least 20, at least 25, at least 30, at least 40, at least 50, and, most preferably, between about 15 to about 30 amino acids. Preferred polypeptides comprising immunogenic or antigenic epitopes are at least 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75,  
80, 85, 90, 95, or 100 amino acid residues in length. Additional non-exclusive preferred antigenic  
35 epitopes include the antigenic epitopes disclosed herein, as well as portions thereof. Antigenic epitopes are useful, for example, to raise antibodies, including monoclonal antibodies, that

specifically bind the epitope. Preferred antigenic epitopes include the antigenic epitopes disclosed herein, as well as any combination of two, three, four, five or more of these antigenic epitopes. Antigenic epitopes can be used as the target molecules in immunoassays. (See, for instance, Wilson et al., Cell 37:767-778 (1984); Sutcliffe et al., Science 219:660-666 (1983)).

5 Non-limiting examples of epitopes of polypeptides that can be used to generate antibodies of the invention include a polypeptide comprising, or alternatively consisting of, at least one, two, three, four, five, six or more of the portion(s) of SEQ ID NO:Y specified in Table 1B. These polypeptide fragments have been determined to bear antigenic epitopes of the proteins of the invention by the analysis of the Jameson-Wolf antigenic index that is included in the  
10 DNASTar suite of computer programs. By "comprise" it is intended that a polypeptide contains at least one, two, three, four, five, six or more of the portion(s) of SEQ ID NO:Y shown in Table 1B, but it may contain additional flanking residues on either the amino or carboxyl termini of the recited portion. Such additional flanking sequences are preferably sequences naturally found adjacent to the portion; i.e., contiguous sequence shown in SEQ ID NO:Y. The flanking sequence  
15 may, however, be sequences from a heterologous polypeptide, such as from another protein described herein or from a heterologous polypeptide not described herein. In particular embodiments, epitope portions of a polypeptide of the invention comprise one, two, three, or more of the portions of SEQ ID NO:Y shown in Table 1B.

Similarly, immunogenic epitopes can be used, for example, to induce antibodies  
20 according to methods well known in the art. See, for instance, Sutcliffe et al., *supra*; Wilson et al., *supra*; Chow et al., Proc. Natl. Acad. Sci. USA 82:910-914; and Bittle et al., J. Gen. Virol. 66:2347-2354 (1985). Preferred immunogenic epitopes include the immunogenic epitopes disclosed herein, as well as any combination of two, three, four, five or more of these immunogenic epitopes. The polypeptides comprising one or more immunogenic epitopes may be  
25 presented for eliciting an antibody response together with a carrier protein, such as an albumin, to an animal system (such as rabbit or mouse), or, if the polypeptide is of sufficient length (at least about 25 amino acids), the polypeptide may be presented without a carrier. However, immunogenic epitopes comprising as few as 8 to 10 amino acids have been shown to be sufficient to raise antibodies capable of binding to, at the very least, linear epitopes in a denatured  
30 polypeptide (e.g., in Western blotting).

Epitope-bearing polypeptides of the present invention may be used to induce antibodies according to methods well known in the art including, but not limited to, *in vivo* immunization, *in vitro* immunization, and phage display methods. See, e.g., Sutcliffe et al., *supra*; Wilson et al., *supra*, and Bittle et al., J. Gen. Virol., 66:2347-2354 (1985). If *in vivo*  
35 immunization is used, animals may be immunized with free peptide; however, anti-peptide antibody titer may be boosted by coupling the peptide to a macromolecular carrier, such as

keyhole limpet hemacyanin (KLH) or tetanus toxoid. For instance, peptides containing cysteine residues may be coupled to a carrier using a linker such as maleimidobenzoyl- N-hydroxysuccinimide ester (MBS), while other peptides may be coupled to carriers using a more general linking agent such as glutaraldehyde. Animals such as rabbits, rats and mice are immunized with either free or carrier- coupled peptides, for instance, by intraperitoneal and/or intradermal injection of emulsions containing about 100 µg of peptide or carrier protein and Freund's adjuvant or any other adjuvant known for stimulating an immune response. Several booster injections may be needed, for instance, at intervals of about two weeks, to provide a useful titer of anti-peptide antibody which can be detected, for example, by ELISA assay using free peptide adsorbed to a solid surface. The titer of anti-peptide antibodies in serum from an immunized animal may be increased by selection of anti-peptide antibodies, for instance, by adsorption to the peptide on a solid support and elution of the selected antibodies according to methods well known in the art.

As one of skill in the art will appreciate, and as discussed above, the polypeptides of the present invention (e.g., those comprising an immunogenic or antigenic epitope) can be fused to heterologous polypeptide sequences. For example, polypeptides of the present invention (including fragments or variants thereof), may be fused with the constant domain of immunoglobulins (IgA, IgE, IgG, IgM), or portions thereof (CH1, CH2, CH3, or any combination thereof and portions thereof, resulting in chimeric polypeptides. By way of another non-limiting example, polypeptides and/or antibodies of the present invention (including fragments or variants thereof) may be fused with albumin (including but not limited to recombinant human serum albumin or fragments or variants thereof (see, e.g., U.S. Patent No. 5,876,969, issued March 2, 1999, EP Patent 0 413 622, and U.S. Patent No. 5,766,883, issued June 16, 1998, herein incorporated by reference in their entirety)). In a preferred embodiment, polypeptides and/or antibodies of the present invention (including fragments or variants thereof) are fused with the mature form of human serum albumin (i.e., amino acids 1 – 585 of human serum albumin as shown in Figures 1 and 2 of EP Patent 0 322 094) which is herein incorporated by reference in its entirety. In another preferred embodiment, polypeptides and/or antibodies of the present invention (including fragments or variants thereof) are fused with polypeptide fragments comprising, or alternatively consisting of, amino acid residues 1-z of human serum albumin, where z is an integer from 369 to 419, as described in U.S. Patent 5,766,883 herein incorporated by reference in its entirety. Polypeptides and/or antibodies of the present invention (including fragments or variants thereof) may be fused to either the N- or C-terminal end of the heterologous protein (e.g., immunoglobulin Fc polypeptide or human serum albumin polypeptide). Polynucleotides encoding fusion proteins of the invention are also encompassed by the invention.

Such fusion proteins as those described above may facilitate purification and may increase half-life *in vivo*. This has been shown for chimeric proteins consisting of the first two

domains of the human CD4-polypeptide and various domains of the constant regions of the heavy or light chains of mammalian immunoglobulins. See, e.g., EP 394,827; Traunecker et al., *Nature*, 331:84-86 (1988). Enhanced delivery of an antigen across the epithelial barrier to the immune system has been demonstrated for antigens (e.g., insulin) conjugated to an FcRn binding partner such as IgG or Fc fragments (see, e.g., PCT Publications WO 96/22024 and WO 99/04813). IgG fusion proteins that have a disulfide-linked dimeric structure due to the IgG portion desulfide bonds have also been found to be more efficient in binding and neutralizing other molecules than monomeric polypeptides or fragments thereof alone. See, e.g., Fountoulakis et al., *J. Biochem.*, 270:3958-3964 (1995). Nucleic acids encoding the above epitopes can also be recombined with a gene of interest as an epitope tag (e.g., the hemagglutinin (HA) tag or flag tag) to aid in detection and purification of the expressed polypeptide. For example, a system described by Janknecht et al. allows for the ready purification of non-denatured fusion proteins expressed in human cell lines (Janknecht et al., 1991, *Proc. Natl. Acad. Sci. USA* 88:8972- 897). In this system, the gene of interest is subcloned into a vaccinia recombination plasmid such that the open reading frame of the gene is translationally fused to an amino-terminal tag consisting of six histidine residues. The tag serves as a matrix binding domain for the fusion protein. Extracts from cells infected with the recombinant vaccinia virus are loaded onto Ni<sup>2+</sup> nitriloacetic acid-agarose column and histidine-tagged proteins can be selectively eluted with imidazole-containing buffers.

## 20 *Fusion Proteins*

Any polypeptide of the present invention can be used to generate fusion proteins. For example, the polypeptide of the present invention, when fused to a second protein, can be used as an antigenic tag. Antibodies raised against the polypeptide of the present invention can be used to indirectly detect the second protein by binding to the polypeptide. Moreover, because secreted proteins target cellular locations based on trafficking signals, polypeptides of the present invention which are shown to be secreted can be used as targeting molecules once fused to other proteins.

Examples of domains that can be fused to polypeptides of the present invention include not only heterologous signal sequences, but also other heterologous functional regions. The fusion does not necessarily need to be direct, but may occur through linker sequences.

30 In certain preferred embodiments, proteins of the invention are fusion proteins comprising an amino acid sequence that is an N and/or C- terminal deletion of a polypeptide of the invention. In preferred embodiments, the invention is directed to a fusion protein comprising an amino acid sequence that is at least 90%, 95%, 96%, 97%, 98% or 99% identical to a polypeptide sequence of the invention. Polynucleotides encoding these proteins are also encompassed by the invention.

Moreover, fusion proteins may also be engineered to improve characteristics of the polypeptide of the present invention. For instance, a region of additional amino acids, particularly charged amino acids, may be added to the N-terminus of the polypeptide to improve stability and persistence during purification from the host cell or subsequent handling and storage. Also, peptide moieties may be added to the polypeptide to facilitate purification. Such regions may be removed prior to final preparation of the polypeptide. The addition of peptide moieties to facilitate handling of polypeptides are familiar and routine techniques in the art.

As one of skill in the art will appreciate that, as discussed above, polypeptides of the present invention, and epitope-bearing fragments thereof, can be combined with heterologous polypeptide sequences. For example, the polypeptides of the present invention may be fused with heterologous polypeptide sequences, for example, the polypeptides of the present invention may be fused with the constant domain of immunoglobulins (IgA, IgE, IgG, IgM) or portions thereof (CH1, CH2, CH3, and any combination thereof, including both entire domains and portions thereof), or albumin (including, but not limited to, native or recombinant human albumin or fragments or variants thereof (see, e.g., U.S. Patent No. 5,876,969, issued March 2, 1999, EP Patent 0 413 622, and U.S. Patent No. 5,766,883, issued June 16, 1998, herein incorporated by reference in their entirety)), resulting in chimeric polypeptides. For example, EP-A-O 464 533 (Canadian counterpart 2045869) discloses fusion proteins comprising various portions of constant region of immunoglobulin molecules together with another human protein or part thereof. In many cases, the Fc part in a fusion protein is beneficial in therapy and diagnosis, and thus can result in, for example, improved pharmacokinetic properties (EP-A 0232 262). Alternatively, deleting the Fc part after the fusion protein has been expressed, detected, and purified, would be desired. For example, the Fc portion may hinder therapy and diagnosis if the fusion protein is used as an antigen for immunizations. In drug discovery, for example, human proteins, such as hIL-5, have been fused with Fc portions for the purpose of high-throughput screening assays to identify antagonists of hIL-5. See, D. Bennett et al., *J. Molecular Recognition* 8:52-58 (1995); K. Johanson et al., *J. Biol. Chem.* 270:9459-9471 (1995).

Moreover, the polypeptides of the present invention can be fused to marker sequences, such as a polypeptide which facilitates purification of the fused polypeptide. In preferred embodiments, the marker amino acid sequence is a hexa-histidine peptide, such as the tag provided in a pQE vector (QIAGEN, Inc., 9259 Eton Avenue, Chatsworth, CA, 91311), among others, many of which are commercially available. As described in Gentz et al., *Proc. Natl. Acad. Sci. USA* 86:821-824 (1989), for instance, hexa-histidine provides for convenient purification of the fusion protein. Another peptide tag useful for purification, the "HA" tag, corresponds to an epitope derived from the influenza hemagglutinin protein (Wilson et al., *Cell* 37:767 (1984)).



Additional fusion proteins of the invention may be generated through the techniques of gene-shuffling, motif-shuffling, exon-shuffling, and/or codon-shuffling (collectively referred to as "DNA shuffling"). DNA shuffling may be employed to modulate the activities of polypeptides of the invention, such methods can be used to generate polypeptides with altered activity, as well as agonists and antagonists of the polypeptides. See, generally, U.S. Patent Nos. 5,605,793; 5,811,238; 5,830,721; 5,834,252; and 5,837,458, and Patten et al., Curr. Opin. Biotechnol. 8:724-33 (1997); Harayama, Trends Biotechnol. 16(2):76-82 (1998); Hansson, et al., J. Mol. Biol. 287:265-76 (1999); and Lorenzo and Blasco, Biotechniques 24(2):308-13 (1998) (each of these patents and publications are hereby incorporated by reference in its entirety). In one embodiment, alteration of polynucleotides corresponding to SEQ ID NO:X and the polypeptides encoded by these polynucleotides may be achieved by DNA shuffling. DNA shuffling involves the assembly of two or more DNA segments by homologous or site-specific recombination to generate variation in the polynucleotide sequence. In another embodiment, polynucleotides of the invention, or the encoded polypeptides, may be altered by being subjected to random mutagenesis by error-prone PCR, random nucleotide insertion or other methods prior to recombination. In another embodiment, one or more components, motifs, sections, parts, domains, fragments, etc., of a polynucleotide encoding a polypeptide of the invention may be recombined with one or more components, motifs, sections, parts, domains, fragments, etc. of one or more heterologous molecules.

Thus, any of these above fusions can be engineered using the polynucleotides or the polypeptides of the present invention.

#### Recombinant and Synthetic Production of Polypeptides of the Invention

The present invention also relates to vectors containing the polynucleotide of the present invention, host cells, and the production of polypeptides by synthetic and recombinant techniques. The vector may be, for example, a phage, plasmid, viral, or retroviral vector. Retroviral vectors may be replication competent or replication defective. In the latter case, viral propagation generally will occur only in complementing host cells.

The polynucleotides of the invention may be joined to a vector containing a selectable marker for propagation in a host. Generally, a plasmid vector is introduced in a precipitate, such as a calcium phosphate precipitate, or in a complex with a charged lipid. If the vector is a virus, it may be packaged in vitro using an appropriate packaging cell line and then transduced into host cells.

The polynucleotide insert should be operatively linked to an appropriate promoter, such as the phage lambda PL promoter, the E. coli lac, trp, phoA and tac promoters, the SV40 early and late promoters and promoters of retroviral LTRs, to name a few. Other suitable

promoters will be known to the skilled artisan. The expression constructs will further contain sites for transcription initiation, termination, and, in the transcribed region, a ribosome binding site for translation. The coding portion of the transcripts expressed by the constructs will preferably include a translation initiating codon at the beginning and a termination codon (UAA, UGA or  
5 UAG) appropriately positioned at the end of the polypeptide to be translated.

As indicated, the expression vectors will preferably include at least one selectable marker. Such markers include dihydrofolate reductase, G418, glutamine synthase, or neomycin resistance for eukaryotic cell culture, and tetracycline, kanamycin or ampicillin resistance genes for culturing in *E. coli* and other bacteria. Representative examples of appropriate hosts include,  
10 but are not limited to, bacterial cells, such as *E. coli*, *Streptomyces* and *Salmonella typhimurium* cells; fungal cells, such as yeast cells (e.g., *Saccharomyces cerevisiae* or *Pichia pastoris* (ATCC Accession No. 201178)); insect cells such as *Drosophila* S2 and *Spodoptera Sf9* cells; animal cells such as CHO, COS, 293, and Bowes melanoma cells; and plant cells. Appropriate culture mediums and conditions for the above-described host cells are known in the art.

Among vectors preferred for use in bacteria include pQE70, pQE60 and pQE-9, available from QIAGEN, Inc.; pBluescript vectors, Phagescript vectors, pNH8A, pNH16a, pNH18A, pNH46A, available from Stratagene Cloning Systems, Inc.; and ptrc99a, pKK223-3, pKK233-3, pDR540, pRIT5 available from Pharmacia Biotech, Inc. Among preferred eukaryotic vectors are pWLNEO, pSV2CAT, pOG44, pXT1 and pSG available from Stratagene; and pSVK3,  
20 pBPV, pMSG and pSVL available from Pharmacia. Preferred expression vectors for use in yeast systems include, but are not limited to pYES2, pYD1, pTEF1/Zeo, pYES2/GS, pPICZ, pGAPZ, pGAPZalph, pPIC9, pPIC3.5, pHIL-D2, pHIL-S1, pPIC3.5K, pPIC9K, and PAO815 (all available from Invitrogen, Carlsbad, CA). Other suitable vectors will be readily apparent to the skilled artisan.

Vectors which use glutamine synthase (GS) or DHFR as the selectable markers can be amplified in the presence of the drugs methionine sulfoximine or methotrexate, respectively. An advantage of glutamine synthase based vectors are the availability of cell lines (e.g., the murine myeloma cell line, NS0) which are glutamine synthase negative. Glutamine synthase expression systems can also function in glutamine synthase expressing cells (e.g., Chinese Hamster Ovary  
30 (CHO) cells) by providing additional inhibitor to prevent the functioning of the endogenous gene. A glutamine synthase expression system and components thereof are detailed in PCT publications: WO87/04462; WO86/05807; WO89/01036; WO89/10404; and WO91/06657, which are hereby incorporated in their entireties by reference herein. Additionally, glutamine synthase expression vectors can be obtained from Lonza Biologics, Inc. (Portsmouth, NH). Expression and production  
35 of monoclonal antibodies using a GS expression system in murine myeloma cells is described in

Bebbington *et al.*, *Biotechnology* 10:169(1992) and in Biblia and Robinson *Biotechnol. Prog.* 11:1 (1995) which are herein incorporated by reference.

The present invention also relates to host cells containing the above-described vector constructs described herein, and additionally encompasses host cells containing nucleotide sequences of the invention that are operably associated with one or more heterologous control regions (e.g., promoter and/or enhancer) using techniques known of in the art. The host cell can be a higher eukaryotic cell, such as a mammalian cell (e.g., a human derived cell), or a lower eukaryotic cell, such as a yeast cell, or the host cell can be a prokaryotic cell, such as a bacterial cell. A host strain may be chosen which modulates the expression of the inserted gene sequences, or modifies and processes the gene product in the specific fashion desired. Expression from certain promoters can be elevated in the presence of certain inducers; thus expression of the genetically engineered polypeptide may be controlled. Furthermore, different host cells have characteristics and specific mechanisms for the translational and post-translational processing and modification (e.g., phosphorylation, cleavage) of proteins. Appropriate cell lines can be chosen to ensure the desired modifications and processing of the foreign protein expressed.

Introduction of the nucleic acids and nucleic acid constructs of the invention into the host cell can be effected by calcium phosphate transfection, DEAE-dextran mediated transfection, cationic lipid-mediated transfection, electroporation, transduction, infection, or other methods. Such methods are described in many standard laboratory manuals, such as Davis *et al.*, *Basic Methods In Molecular Biology* (1986). It is specifically contemplated that the polypeptides of the present invention may in fact be expressed by a host cell lacking a recombinant vector.

In addition to encompassing host cells containing the vector constructs discussed herein, the invention also encompasses primary, secondary, and immortalized host cells of vertebrate origin, particularly mammalian origin, that have been engineered to delete or replace endogenous genetic material (e.g., the coding sequence), and/or to include genetic material (e.g., heterologous polynucleotide sequences) that is operably associated with polynucleotides of the invention, and which activates, alters, and/or amplifies endogenous polynucleotides. For example, techniques known in the art may be used to operably associate heterologous control regions (e.g., promoter and/or enhancer) and endogenous polynucleotide sequences via homologous recombination (see, e.g., US Patent Number 5,641,670, issued June 24, 1997; International Publication Number WO 96/29411; International Publication Number WO 94/12650; Koller *et al.*, *Proc. Natl. Acad. Sci. USA* 86:8932-8935 (1989); and Zijlstra *et al.*, *Nature* 342:435-438 (1989), the disclosures of each of which are incorporated by reference in their entireties).

Polypeptides of the invention can be recovered and purified from recombinant cell cultures by well-known methods including ammonium sulfate or ethanol precipitation, acid extraction, anion or cation exchange chromatography, phosphocellulose chromatography,

hydrophobic interaction chromatography, affinity chromatography, hydroxylapatite chromatography and lectin chromatography. Most preferably, high performance liquid chromatography ("HPLC") is employed for purification.

Polypeptides of the present invention can also be recovered from: products purified  
5 from natural sources, including bodily fluids, tissues and cells, whether directly isolated or cultured; products of chemical synthetic procedures; and products produced by recombinant techniques from a prokaryotic or eukaryotic host, including, for example, bacterial, yeast, higher plant, insect, and mammalian cells. Depending upon the host employed in a recombinant production procedure, the polypeptides of the present invention may be glycosylated or may be  
10 non-glycosylated. In addition, polypeptides of the invention may also include an initial modified methionine residue, in some cases as a result of host-mediated processes. Thus, it is well known in the art that the N-terminal methionine encoded by the translation initiation codon generally is removed with high efficiency from any protein after translation in all eukaryotic cells. While the N-terminal methionine on most proteins also is efficiently removed in most prokaryotes, for some  
15 proteins, this prokaryotic removal process is inefficient, depending on the nature of the amino acid to which the N-terminal methionine is covalently linked.

In one embodiment, the yeast *Pichia pastoris* is used to express polypeptides of the invention in a eukaryotic system. *Pichia pastoris* is a methylotrophic yeast which can metabolize methanol as its sole carbon source. A main step in the methanol metabolism pathway is the  
20 oxidation of methanol to formaldehyde using O<sub>2</sub>. This reaction is catalyzed by the enzyme alcohol oxidase. In order to metabolize methanol as its sole carbon source, *Pichia pastoris* must generate high levels of alcohol oxidase due, in part, to the relatively low affinity of alcohol oxidase for O<sub>2</sub>. Consequently, in a growth medium depending on methanol as a main carbon source, the promoter region of one of the two alcohol oxidase genes (*AOX1*) is highly active. In the presence of  
25 methanol, alcohol oxidase produced from the *AOX1* gene comprises up to approximately 30% of the total soluble protein in *Pichia pastoris*. See Ellis, S.B., *et al.*, *Mol. Cell. Biol.* 5:1111-21 (1985); Koutz, P.J., *et al.*, *Yeast* 5:167-77 (1989); Tschopp, J.F., *et al.*, *Nucl. Acids Res.* 15:3859-76 (1987). Thus, a heterologous coding sequence, such as, for example, a polynucleotide of the present invention, under the transcriptional regulation of all or part of the *AOX1* regulatory  
30 sequence is expressed at exceptionally high levels in *Pichia* yeast grown in the presence of methanol.

In one example, the plasmid vector pPIC9K is used to express DNA encoding a polypeptide of the invention, as set forth herein, in a *Pichea* yeast system essentially as described in "*Pichia* Protocols: Methods in Molecular Biology," D.R. Higgins and J. Cregg, eds. The  
35 Humana Press, Totowa, NJ, 1998. This expression vector allows expression and secretion of a

polypeptide of the invention by virtue of the strong *AOX1* promoter linked to the *Pichia pastoris* alkaline phosphatase (PHO) secretory signal peptide (i.e., leader) located upstream of a multiple cloning site.

Many other yeast vectors could be used in place of pPIC9K, such as, pYES2, pYD1, pTEF1/*Zeo*, pYES2/GS, pPICZ, pGAPZ, pGAPZalpha, pPIC9, pPIC3.5, pHIL-D2, pHIL-S1, pPIC3.5K, and PAO815, as one skilled in the art would readily appreciate, as long as the proposed expression construct provides appropriately located signals for transcription, translation, secretion (if desired), and the like, including an in-frame AUG as required.

In another embodiment, high-level expression of a heterologous coding sequence, such as, for example, a polynucleotide of the present invention, may be achieved by cloning the heterologous polynucleotide of the invention into an expression vector such as, for example, pGAPZ or pGAPZalpha, and growing the yeast culture in the absence of methanol.

In addition to encompassing host cells containing the vector constructs discussed herein, the invention also encompasses primary, secondary, and immortalized host cells of vertebrate origin, particularly mammalian origin, that have been engineered to delete or replace endogenous genetic material (e.g., coding sequence), and/or to include genetic material (e.g., heterologous polynucleotide sequences) that is operably associated with polynucleotides of the invention, and which activates, alters, and/or amplifies endogenous polynucleotides. For example, techniques known in the art may be used to operably associate heterologous control regions (e.g., promoter and/or enhancer) and endogenous polynucleotide sequences via homologous recombination (see, e.g., U.S. Patent No. 5,641,670, issued June 24, 1997; International Publication No. WO 96/29411, published September 26, 1996; International Publication No. WO 94/12650, published August 4, 1994; Koller et al., *Proc. Natl. Acad. Sci. USA* 86:8932-8935 (1989); and Zijlstra et al., *Nature* 342:435-438 (1989), the disclosures of each of which are incorporated by reference in their entireties).

In addition, polypeptides of the invention can be chemically synthesized using techniques known in the art (e.g., see Creighton, 1983, *Proteins: Structures and Molecular Principles*, W.H. Freeman & Co., N.Y., and Hunkapiller et al., *Nature*, 310:105-111 (1984)). For example, a polypeptide corresponding to a fragment of a polypeptide can be synthesized by use of a peptide synthesizer. Furthermore, if desired, nonclassical amino acids or chemical amino acid analogs can be introduced as a substitution or addition into the polypeptide sequence. Non-classical amino acids include, but are not limited to, to the D-isomers of the common amino acids, 2,4-diaminobutyric acid,  $\alpha$ -amino isobutyric acid, 4-aminobutyric acid, Abu, 2-amino butyric acid,  $\gamma$ -Abu, e-Ahx, 6-amino hexanoic acid, Aib, 2-amino isobutyric acid, 3-amino propionic acid, ornithine, norleucine, norvaline, hydroxyproline, sarcosine, citrulline, homocitrulline, cysteic acid, t-butylglycine, t-butylalanine, phenylglycine, cyclohexylalanine, b-alanine, fluoro-amino acids,

designer amino acids such as  $\beta$ -methyl amino acids,  $\alpha$ -methyl amino acids, Na-methyl amino acids, and amino acid analogs in general. Furthermore, the amino acid can be D (dextrorotary) or L (levorotary).

The invention encompasses polypeptides of the present invention which are differentially modified during or after translation, e.g., by glycosylation, acetylation, phosphorylation, amidation, derivatization by known protecting/blocking groups, proteolytic cleavage, linkage to an antibody molecule or other cellular ligand, etc. Any of numerous chemical modifications may be carried out by known techniques, including but not limited, to specific chemical cleavage by cyanogen bromide, trypsin, chymotrypsin, papain, V8 protease,  $\text{NaBH}_4$ ; acetylation, formylation, oxidation, reduction; metabolic synthesis in the presence of tunicamycin; etc.

Additional post-translational modifications encompassed by the invention include, for example, e.g., N-linked or O-linked carbohydrate chains, processing of N-terminal or C-terminal ends), attachment of chemical moieties to the amino acid backbone, chemical modifications of N-linked or O-linked carbohydrate chains, and addition or deletion of an N-terminal methionine residue as a result of procaryotic host cell expression. The polypeptides may also be modified with a detectable label, such as an enzymatic, fluorescent, isotopic or affinity label to allow for detection and isolation of the protein.

Examples of suitable enzymes include horseradish peroxidase, alkaline phosphatase, beta-galactosidase, or acetylcholinesterase; examples of suitable prosthetic group complexes include streptavidin/biotin and avidin/biotin; examples of suitable fluorescent materials include umbelliferone, fluorescein, fluorescein isothiocyanate, rhodamine, dichlorotriazinylamine fluorescein, dansyl chloride or phycoerythrin; an example of a luminescent material includes luminol; examples of bioluminescent materials include luciferase, luciferin, and aequorin; and examples of suitable radioactive material include iodine ( $^{121}\text{I}$ ,  $^{123}\text{I}$ ,  $^{125}\text{I}$ ,  $^{131}\text{I}$ ), carbon ( $^{14}\text{C}$ ), sulfur ( $^{35}\text{S}$ ), tritium ( $^3\text{H}$ ), indium ( $^{111}\text{In}$ ,  $^{112}\text{In}$ ,  $^{113\text{m}}\text{In}$ ,  $^{115\text{m}}\text{In}$ ), technetium ( $^{99}\text{Tc}$ ,  $^{99\text{m}}\text{Tc}$ ), thallium ( $^{201}\text{Tl}$ ), gallium ( $^{68}\text{Ga}$ ,  $^{67}\text{Ga}$ ), palladium ( $^{103}\text{Pd}$ ), molybdenum ( $^{99}\text{Mo}$ ), xenon ( $^{133}\text{Xe}$ ), fluorine ( $^{18}\text{F}$ ),  $^{153}\text{Sm}$ ,  $^{177}\text{Lu}$ ,  $^{159}\text{Gd}$ ,  $^{149}\text{Pm}$ ,  $^{140}\text{La}$ ,  $^{175}\text{Yb}$ ,  $^{166}\text{Ho}$ ,  $^{90}\text{Y}$ ,  $^{47}\text{Sc}$ ,  $^{186}\text{Re}$ ,  $^{188}\text{Re}$ ,  $^{142}\text{Pr}$ ,  $^{105}\text{Rh}$ , and  $^{97}\text{Ru}$ .

In specific embodiments, a polypeptide of the present invention or fragment or variant thereof is attached to macrocyclic chelators that associate with radiometal ions, including but not limited to,  $^{177}\text{Lu}$ ,  $^{90}\text{Y}$ ,  $^{166}\text{Ho}$ , and  $^{153}\text{Sm}$ , to polypeptides. In a preferred embodiment, the radiometal ion associated with the macrocyclic chelators is  $^{111}\text{In}$ . In another preferred embodiment, the radiometal ion associated with the macrocyclic chelator is  $^{90}\text{Y}$ . In specific embodiments, the macrocyclic chelator is 1,4,7,10-tetraazacyclododecane- $\text{N,N',N'',N'''}\text{-tetraacetic acid (DOTA)}$ . In other specific embodiments, DOTA is attached to an antibody of the invention or fragment thereof via a linker molecule. Examples of linker molecules useful for conjugating

DOTA to a polypeptide are commonly known in the art - see, for example, DeNardo et al., Clin Cancer Res. 4(10):2483-90 (1998); Peterson et al., Bioconjug. Chem. 10(4):553-7 (1999); and Zimmerman et al, Nucl. Med. Biol. 26(8):943-50 (1999); which are hereby incorporated by reference in their entirety.

5 As mentioned, the proteins of the invention may be modified by either natural processes, such as posttranslational processing, or by chemical modification techniques which are well known in the art. It will be appreciated that the same type of modification may be present in the same or varying degrees at several sites in a given polypeptide. Polypeptides of the invention may be branched, for example, as a result of ubiquitination, and they may be cyclic, with or  
10 without branching. Cyclic, branched, and branched cyclic polypeptides may result from posttranslation natural processes or may be made by synthetic methods. Modifications include acetylation, acylation, ADP-ribosylation, amidation, covalent attachment of flavin, covalent attachment of a heme moiety, covalent attachment of a nucleotide or nucleotide derivative, covalent attachment of a lipid or lipid derivative, covalent attachment of phosphatidylinositol,  
15 cross-linking, cyclization, disulfide bond formation, demethylation, formation of covalent cross-links, formation of cysteine, formation of pyroglutamate, formylation, gamma-carboxylation, glycosylation, GPI anchor formation, hydroxylation, iodination, methylation, myristoylation, oxidation, pegylation, proteolytic processing, phosphorylation, prenylation, racemization, selenoylation, sulfation, transfer-RNA mediated addition of amino acids to proteins such as arginylation, and ubiquitination. (See, for instance, PROTEINS - STRUCTURE AND  
20 MOLECULAR PROPERTIES, 2nd Ed., T. E. Creighton, W. H. Freeman and Company, New York (1993); POSTTRANSLATIONAL COVALENT MODIFICATION OF PROTEINS, B. C. Johnson, Ed., Academic Press, New York, pgs. 1-12 (1983); Seifter et al., Meth. Enzymol. 182:626-646 (1990); Rattan et al., Ann. N.Y. Acad. Sci. 663:48-62 (1992)).

25 Also provided by the invention are chemically modified derivatives of the polypeptides of the invention which may provide additional advantages such as increased solubility, stability and circulating time of the polypeptide, or decreased immunogenicity (see U.S. Patent No. 4,179,337). The chemical moieties for derivitization may be selected from water soluble polymers such as polyethylene glycol, ethylene glycol/propylene glycol copolymers,  
30 carboxymethylcellulose, dextran, polyvinyl alcohol and the like. The polypeptides may be modified at random positions within the molecule, or at predetermined positions within the molecule and may include one, two, three or more attached chemical moieties.

The polymer may be of any molecular weight, and may be branched or unbranched. For polyethylene glycol, the preferred molecular weight is between about 1 kDa and about 100 kDa  
35 (the term "about" indicating that in preparations of polyethylene glycol, some molecules will weigh more, some less, than the stated molecular weight) for ease in handling and manufacturing.

Other sizes may be used, depending on the desired therapeutic profile (e.g., the duration of sustained release desired, the effects, if any on biological activity, the ease in handling, the degree or lack of antigenicity and other known effects of the polyethylene glycol to a therapeutic protein or analog). For example, the polyethylene glycol may have an average molecular weight of about

5 200, 500, 1000, 1500, 2000, 2500, 3000, 3500, 4000, 4500, 5000, 5500, 6000, 6500, 7000, 7500, 8000, 8500, 9000, 9500, 10,000, 10,500, 11,000, 11,500, 12,000, 12,500, 13,000, 13,500, 14,000, 14,500, 15,000, 15,500, 16,000, 16,500, 17,000, 17,500, 18,000, 18,500, 19,000, 19,500, 20,000, 25,000, 30,000, 35,000, 40,000, 45,000, 50,000, 55,000, 60,000, 65,000, 70,000, 75,000, 80,000, 85,000, 90,000, 95,000, or 100,000 kDa.

10 As noted above, the polyethylene glycol may have a branched structure. Branched polyethylene glycols are described, for example, in U.S. Patent No. 5,643,575; Morpurgo *et al.*, *Appl. Biochem. Biotechnol.* 56:59-72 (1996); Vorobjev *et al.*, *Nucleosides Nucleotides* 18:2745-2750 (1999); and Caliceti *et al.*, *Bioconjug. Chem.* 10:638-646 (1999), the disclosures of each of which are incorporated herein by reference.

15 The polyethylene glycol molecules (or other chemical moieties) should be attached to the protein with consideration of effects on functional or antigenic domains of the protein. There are a number of attachment methods available to those skilled in the art, such as, for example, the method disclosed in EP 0 401 384 (coupling PEG to G-CSF), herein incorporated by reference; see also Malik *et al.*, *Exp. Hematol.* 20:1028-1035 (1992), reporting pegylation of GM-CSF using

20 tresyl chloride. For example, polyethylene glycol may be covalently bound through amino acid residues via a reactive group, such as a free amino or carboxyl group. Reactive groups are those to which an activated polyethylene glycol molecule may be bound. The amino acid residues having a free amino group may include lysine residues and the N-terminal amino acid residues; those having a free carboxyl group may include aspartic acid residues glutamic acid residues and the

25 C-terminal amino acid residue. Sulfhydryl groups may also be used as a reactive group for attaching the polyethylene glycol molecules. Preferred for therapeutic purposes is attachment at an amino group, such as attachment at the N-terminus or lysine group.

As suggested above, polyethylene glycol may be attached to proteins via linkage to any of a number of amino acid residues. For example, polyethylene glycol can be linked to

30 proteins via covalent bonds to lysine, histidine, aspartic acid, glutamic acid, or cysteine residues. One or more reaction chemistries may be employed to attach polyethylene glycol to specific amino acid residues (e.g., lysine, histidine, aspartic acid, glutamic acid, or cysteine) of the protein or to more than one type of amino acid residue (e.g., lysine, histidine, aspartic acid, glutamic acid, cysteine and combinations thereof) of the protein.

35 One may specifically desire proteins chemically modified at the N-terminus. Using polyethylene glycol as an illustration of the present composition, one may select from a variety of



polyethylene glycol molecules (by molecular weight, branching, etc.), the proportion of polyethylene glycol molecules to protein (polypeptide) molecules in the reaction mix, the type of pegylation reaction to be performed, and the method of obtaining the selected N-terminally pegylated protein. The method of obtaining the N-terminally pegylated preparation (i.e.,  
5 separating this moiety from other monopegylated moieties if necessary) may be by purification of the N-terminally pegylated material from a population of pegylated protein molecules. Selective proteins chemically modified at the N-terminus modification may be accomplished by reductive alkylation that exploits differential reactivity of different types of primary amino groups (lysine versus the N-terminal) available for derivatization in a particular protein. Under the appropriate  
10 reaction conditions, substantially selective derivatization of the protein at the N-terminus with a carbonyl group containing polymer is achieved.

As indicated above, pegylation of the proteins of the invention may be accomplished by any number of means. For example, polyethylene glycol may be attached to the protein either directly or by an intervening linker. Linkerless systems for attaching polyethylene glycol to  
15 proteins are described in Delgado et al., Crit. Rev. Thera. Drug Carrier Sys. 9:249-304 (1992); Francis et al., Intern. J. of Hematol. 68:1-18 (1998); U.S. Patent No. 4,002,531; U.S. Patent No. 5,349,052; WO 95/06058; and WO 98/32466, the disclosures of each of which are incorporated herein by reference.

One system for attaching polyethylene glycol directly to amino acid residues of  
20 proteins without an intervening linker employs tresylated MPEG, which is produced by the modification of monmethoxy polyethylene glycol (MPEG) using tresylchloride ( $\text{ClSO}_2\text{CH}_2\text{CF}_3$ ). Upon reaction of protein with tresylated MPEG, polyethylene glycol is directly attached to amine groups of the protein. Thus, the invention includes protein-polyethylene glycol conjugates produced by reacting proteins of the invention with a polyethylene glycol molecule having a  
25 2,2,2-trifluoroethane sulphonyl group.

Polyethylene glycol can also be attached to proteins using a number of different intervening linkers. For example, U.S. Patent No. 5,612,460, the entire disclosure of which is incorporated herein by reference, discloses urethane linkers for connecting polyethylene glycol to proteins. Protein-polyethylene glycol conjugates wherein the polyethylene glycol is attached to  
30 the protein by a linker can also be produced by reaction of proteins with compounds such as MPEG-succinimidylsuccinate, MPEG activated with 1,1'-carbonyldiimidazole, MPEG-2,4,5-trichloropenylcarbonate, MPEG-p-nitrophenolcarbonate, and various MPEG-succinate derivatives. A number of additional polyethylene glycol derivatives and reaction chemistries for attaching polyethylene glycol to proteins are described in International Publication No.  
35 WO 98/32466, the entire disclosure of which is incorporated herein by reference. Pegylated

protein products produced using the reaction chemistries set out herein are included within the scope of the invention.

The number of polyethylene glycol moieties attached to each protein of the invention (i.e., the degree of substitution) may also vary. For example, the pegylated proteins of the invention may be linked, on average, to 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 15, 17, 20, or more polyethylene glycol molecules. Similarly, the average degree of substitution within ranges such as 1-3, 2-4, 3-5, 4-6, 5-7, 6-8, 7-9, 8-10, 9-11, 10-12, 11-13, 12-14, 13-15, 14-16, 15-17, 16-18, 17-19, or 18-20 polyethylene glycol moieties per protein molecule. Methods for determining the degree of substitution are discussed, for example, in Delgado et al., Crit. Rev. Thera. Drug Carrier Sys. 9:249-304 (1992).

The polypeptides of the invention can be recovered and purified from chemical synthesis and recombinant cell cultures by standard methods which include, but are not limited to, ammonium sulfate or ethanol precipitation, acid extraction, anion or cation exchange chromatography, phosphocellulose chromatography, hydrophobic interaction chromatography, affinity chromatography, hydroxylapatite chromatography and lectin chromatography. Most preferably, high performance liquid chromatography ("HPLC") is employed for purification. Well known techniques for refolding protein may be employed to regenerate active conformation when the polypeptide is denatured during isolation and/or purification.

The polypeptides of the invention may be in monomers or multimers (i.e., dimers, trimers, tetramers and higher multimers). Accordingly, the present invention relates to monomers and multimers of the polypeptides of the invention, their preparation, and compositions (preferably, Therapeutics) containing them. In specific embodiments, the polypeptides of the invention are monomers, dimers, trimers or tetramers. In additional embodiments, the multimers of the invention are at least dimers, at least trimers, or at least tetramers.

Multimers encompassed by the invention may be homomers or heteromers. As used herein, the term homomer refers to a multimer containing only polypeptides corresponding to a protein of the invention (e.g., the amino acid sequence of SEQ ID NO:Y, an amino acid sequence encoded by SEQ ID NO:X or the complement of SEQ ID NO:X, the amino acid sequence encoded by the portion of SEQ ID NO:X as defined in columns 8 and 9 of Table 2, and/or an amino acid sequence encoded by cDNA contained in ATCC Deposit No:Z (including fragments, variants, splice variants, and fusion proteins, corresponding to these as described herein)). These homomers may contain polypeptides having identical or different amino acid sequences. In a specific embodiment, a homomer of the invention is a multimer containing only polypeptides having an identical amino acid sequence. In another specific embodiment, a homomer of the invention is a multimer containing polypeptides having different amino acid sequences. In specific embodiments, the multimer of the invention is a homodimer (e.g., containing two polypeptides

having identical or different amino acid sequences) or a homotrimer (e.g., containing three polypeptides having identical and/or different amino acid sequences). In additional embodiments, the homomeric multimer of the invention is at least a homodimer, at least a homotrimer, or at least a homotetramer.

5           As used herein, the term heteromer refers to a multimer containing one or more heterologous polypeptides (i.e., polypeptides of different proteins) in addition to the polypeptides of the invention. In a specific embodiment, the multimer of the invention is a heterodimer, a heterotrimer, or a heterotetramer. In additional embodiments, the heteromeric multimer of the invention is at least a heterodimer, at least a heterotrimer, or at least a heterotetramer.

10           Multimers of the invention may be the result of hydrophobic, hydrophilic, ionic and/or covalent associations and/or may be indirectly linked by, for example, liposome formation. Thus, in one embodiment, multimers of the invention, such as, for example, homodimers or homotrimers, are formed when polypeptides of the invention contact one another in solution. In another embodiment, heteromultimers of the invention, such as, for example, heterotrimers or  
15           heterotetramers, are formed when polypeptides of the invention contact antibodies to the polypeptides of the invention (including antibodies to the heterologous polypeptide sequence in a fusion protein of the invention) in solution. In other embodiments, multimers of the invention are formed by covalent associations with and/or between the polypeptides of the invention. Such covalent associations may involve one or more amino acid residues contained in the polypeptide  
20           sequence (e.g., that recited in SEQ ID NO:Y, encoded by the portion of SEQ ID NO:X as defined in columns 8 and 9 of Table 2, and/or encoded by the cDNA contained in ATCC Deposit No:Z). In one instance, the covalent associations are cross-linking between cysteine residues located within the polypeptide sequences which interact in the native (i.e., naturally occurring) polypeptide. In another instance, the covalent associations are the consequence of chemical or  
25           recombinant manipulation. Alternatively, such covalent associations may involve one or more amino acid residues contained in the heterologous polypeptide sequence in a fusion protein. In one example, covalent associations are between the heterologous sequence contained in a fusion protein of the invention (see, e.g., US Patent Number 5,478,925). In a specific example, the covalent associations are between the heterologous sequence contained in a Fc fusion protein of  
30           the invention (as described herein). In another specific example, covalent associations of fusion proteins of the invention are between heterologous polypeptide sequence from another protein that is capable of forming covalently associated multimers, such as for example, osteoprotegerin (see, e.g., International Publication NO: WO 98/49305, the contents of which are herein incorporated by reference in its entirety). In another embodiment, two or more polypeptides of the invention are  
35           joined through peptide linkers. Examples include those peptide linkers described in U.S. Pat. No. 5,073,627 (hereby incorporated by reference). Proteins comprising multiple polypeptides of the

invention separated by peptide linkers may be produced using conventional recombinant DNA technology.

Another method for preparing multimer polypeptides of the invention involves use of polypeptides of the invention fused to a leucine zipper or isoleucine zipper polypeptide sequence.

5 Leucine zipper and isoleucine zipper domains are polypeptides that promote multimerization of the proteins in which they are found. Leucine zippers were originally identified in several DNA-binding proteins (Landschulz et al., Science 240:1759, (1988)), and have since been found in a variety of different proteins. Among the known leucine zippers are naturally occurring peptides and derivatives thereof that dimerize or trimerize. Examples of leucine zipper domains suitable

10 for producing soluble multimeric proteins of the invention are those described in PCT application WO 94/10308, hereby incorporated by reference. Recombinant fusion proteins comprising a polypeptide of the invention fused to a polypeptide sequence that dimerizes or trimerizes in solution are expressed in suitable host cells, and the resulting soluble multimeric fusion protein is recovered from the culture supernatant using techniques known in the art.

15 Trimeric polypeptides of the invention may offer the advantage of enhanced biological activity. Preferred leucine zipper moieties and isoleucine moieties are those that preferentially form trimers. One example is a leucine zipper derived from lung surfactant protein D (SPD), as described in Hoppe et al. (FEBS Letters 344:191, (1994)) and in U.S. patent application Ser. No. 08/446,922, hereby incorporated by reference. Other peptides derived from naturally occurring

20 trimeric proteins may be employed in preparing trimeric polypeptides of the invention.

In another example, proteins of the invention are associated by interactions between Flag® polypeptide sequence contained in fusion proteins of the invention containing Flag® polypeptide sequence. In a further embodiment, proteins of the invention are associated by interactions between heterologous polypeptide sequence contained in Flag® fusion proteins of the

25 invention and anti-Flag® antibody.

The multimers of the invention may be generated using chemical techniques known in the art. For example, polypeptides desired to be contained in the multimers of the invention may be chemically cross-linked using linker molecules and linker molecule length optimization techniques known in the art (see, e.g., US Patent Number 5,478,925, which is herein incorporated

30 by reference in its entirety). Additionally, multimers of the invention may be generated using techniques known in the art to form one or more inter-molecule cross-links between the cysteine residues located within the sequence of the polypeptides desired to be contained in the multimer (see, e.g., US Patent Number 5,478,925, which is herein incorporated by reference in its entirety). Further, polypeptides of the invention may be routinely modified by the addition of cysteine or

35 biotin to the C-terminus or N-terminus of the polypeptide and techniques known in the art may be applied to generate multimers containing one or more of these modified polypeptides (see, e.g., US

Patent Number 5,478,925, which is herein incorporated by reference in its entirety). Additionally, techniques known in the art may be applied to generate liposomes containing the polypeptide components desired to be contained in the multimer of the invention (see, e.g., US Patent Number 5,478,925, which is herein incorporated by reference in its entirety).

5           Alternatively, multimers of the invention may be generated using genetic engineering techniques known in the art. In one embodiment, polypeptides contained in multimers of the invention are produced recombinantly using fusion protein technology described herein or otherwise known in the art (see, e.g., US Patent Number 5,478,925, which is herein incorporated by reference in its entirety). In a specific embodiment, polynucleotides coding for a homodimer of  
10   the invention are generated by ligating a polynucleotide sequence encoding a polypeptide of the invention to a sequence encoding a linker polypeptide and then further to a synthetic polynucleotide encoding the translated product of the polypeptide in the reverse orientation from the original C-terminus to the N-terminus (lacking the leader sequence) (see, e.g., US Patent Number 5,478,925, which is herein incorporated by reference in its entirety). In another  
15   embodiment, recombinant techniques described herein or otherwise known in the art are applied to generate recombinant polypeptides of the invention which contain a transmembrane domain (or hydrophobic or signal peptide) and which can be incorporated by membrane reconstitution techniques into liposomes (see, e.g., US Patent Number 5,478,925, which is herein incorporated by reference in its entirety).

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#### Antibodies

Further polypeptides of the invention relate to antibodies and T-cell antigen receptors (TCR) which immunospecifically bind a polypeptide, polypeptide fragment, or variant of the invention (e.g., a polypeptide or fragment or variant of the amino acid sequence of SEQ ID NO:Y  
25   or a polypeptide encoded by the cDNA contained in ATCC Deposit No:Z, and/or an epitope, of the present invention) as determined by immunoassays well known in the art for assaying specific antibody-antigen binding. Antibodies of the invention include, but are not limited to, polyclonal, monoclonal, multispecific, human, humanized or chimeric antibodies, single chain antibodies, Fab fragments, F(ab') fragments, fragments produced by a Fab expression library, anti-idiotypic (anti-  
30   Id) antibodies (including, e.g., anti-Id antibodies to antibodies of the invention), intracellularly-made antibodies (i.e., intrabodies), and epitope-binding fragments of any of the above. The term "antibody," as used herein, refers to immunoglobulin molecules and immunologically active portions of immunoglobulin molecules, i.e., molecules that contain an antigen binding site that immunospecifically binds an antigen. The immunoglobulin molecules of the invention can be of  
35   any type (e.g., IgG, IgE, IgM, IgD, IgA and IgY), class (e.g., IgG1, IgG2, IgG3, IgG4, IgA1 and IgA2) or subclass of immunoglobulin molecule. In preferred embodiments, the immunoglobulin

molecules of the invention are IgG1. In other preferred embodiments, the immunoglobulin molecules of the invention are IgG4.

Most preferably the antibodies are human antigen-binding antibody fragments of the present invention and include, but are not limited to, Fab, Fab' and F(ab')<sub>2</sub>, Fd, single-chain Fvs (scFv), single-chain antibodies, disulfide-linked Fvs (sdFv) and fragments comprising either a VL or VH domain. Antigen-binding antibody fragments, including single-chain antibodies, may comprise the variable region(s) alone or in combination with the entirety or a portion of the following: hinge region, CH1, CH2, and CH3 domains. Also included in the invention are antigen-binding fragments also comprising any combination of variable region(s) with a hinge region, CH1, CH2, and CH3 domains. The antibodies of the invention may be from any animal origin including birds and mammals. Preferably, the antibodies are human, murine (e.g., mouse and rat), donkey, sheep, goat, guinea pig, camel, horse, or chicken. As used herein, "human" antibodies include antibodies having the amino acid sequence of a human immunoglobulin and include antibodies isolated from human immunoglobulin libraries or from animals transgenic for one or more human immunoglobulin and that do not express endogenous immunoglobulins, as described infra and, for example in, U.S. Patent No. 5,939,598 by Kucherlapati et al.

The antibodies of the present invention may be monospecific, bispecific, trispecific or of greater multispecificity. Multispecific antibodies may be specific for different epitopes of a polypeptide of the present invention or may be specific for both a polypeptide of the present invention as well as for a heterologous epitope, such as a heterologous polypeptide or solid support material. See, e.g., PCT publications WO 93/17715; WO 92/08802; WO 91/00360; WO 92/05793; Tutt, et al., J. Immunol. 147:60-69 (1991); U.S. Patent Nos. 4,474,893; 4,714,681; 4,925,648; 5,573,920; 5,601,819; Kostelny et al., J. Immunol. 148:1547-1553 (1992).

Antibodies of the present invention may be described or specified in terms of the epitope(s) or portion(s) of a polypeptide of the present invention which they recognize or specifically bind. The epitope(s) or polypeptide portion(s) may be specified as described herein, e.g., by N-terminal and C-terminal positions, or by size in contiguous amino acid residues, or listed in the Tables and Figures. Preferred epitopes of the invention include the predicted epitopes shown in Table 1B, as well as polynucleotides that encode these epitopes. Antibodies which specifically bind any epitope or polypeptide of the present invention may also be excluded. Therefore, the present invention includes antibodies that specifically bind polypeptides of the present invention, and allows for the exclusion of the same.

Antibodies of the present invention may also be described or specified in terms of their cross-reactivity. Antibodies that do not bind any other analog, ortholog, or homolog of a polypeptide of the present invention are included. Antibodies that bind polypeptides with at least 95%, at least 90%, at least 85%, at least 80%, at least 75%, at least 70%, at least 65%, at least

60%, at least 55%, and at least 50% identity (as calculated using methods known in the art and described herein) to a polypeptide of the present invention are also included in the present invention. In specific embodiments, antibodies of the present invention cross-react with murine, rat and/or rabbit homologs of human proteins and the corresponding epitopes thereof. Antibodies  
5 that do not bind polypeptides with less than 95%, less than 90%, less than 85%, less than 80%, less than 75%, less than 70%, less than 65%, less than 60%, less than 55%, and less than 50% identity (as calculated using methods known in the art and described herein) to a polypeptide of the present invention are also included in the present invention. In a specific embodiment, the above-described cross-reactivity is with respect to any single specific antigenic or immunogenic  
10 polypeptide, or combination(s) of 2, 3, 4, 5, or more of the specific antigenic and/or immunogenic polypeptides disclosed herein. Further included in the present invention are antibodies which bind polypeptides encoded by polynucleotides which hybridize to a polynucleotide of the present invention under stringent hybridization conditions (as described herein). Antibodies of the present invention may also be described or specified in terms of their binding affinity to a polypeptide of  
15 the invention. Preferred binding affinities include those with a dissociation constant or  $K_d$  less than  $5 \times 10^{-2}$  M,  $10^{-2}$  M,  $5 \times 10^{-3}$  M,  $10^{-3}$  M,  $5 \times 10^{-4}$  M,  $10^{-4}$  M,  $5 \times 10^{-5}$  M,  $10^{-5}$  M,  $5 \times 10^{-6}$  M,  $10^{-6}$  M,  $5 \times 10^{-7}$  M,  $10^{-7}$  M,  $5 \times 10^{-8}$  M,  $10^{-8}$  M,  $5 \times 10^{-9}$  M,  $10^{-9}$  M,  $5 \times 10^{-10}$  M,  $10^{-10}$  M,  $5 \times 10^{-11}$  M,  $10^{-11}$  M,  $5 \times 10^{-12}$  M,  $10^{-12}$  M,  $5 \times 10^{-13}$  M,  $10^{-13}$  M,  $5 \times 10^{-14}$  M,  $10^{-14}$  M,  $5 \times 10^{-15}$  M, or  $10^{-15}$  M.

20 The invention also provides antibodies that competitively inhibit binding of an antibody to an epitope of the invention as determined by any method known in the art for determining competitive binding, for example, the immunoassays described herein. In preferred embodiments, the antibody competitively inhibits binding to the epitope by at least 95%, at least 90%, at least 85 %, at least 80%, at least 75%, at least 70%, at least 60%, or at least 50%.

25 Antibodies of the present invention may act as agonists or antagonists of the polypeptides of the present invention. For example, the present invention includes antibodies which disrupt the receptor/ligand interactions with the polypeptides of the invention either partially or fully. Preferably, antibodies of the present invention bind an antigenic epitope disclosed herein, or a portion thereof. The invention features both receptor-specific antibodies and  
30 ligand-specific antibodies. The invention also features receptor-specific antibodies which do not prevent ligand binding but prevent receptor activation. Receptor activation (i.e., signaling) may be determined by techniques described herein or otherwise known in the art. For example, receptor activation can be determined by detecting the phosphorylation (e.g., tyrosine or serine/threonine) of the receptor or its substrate by immunoprecipitation followed by western blot analysis (for  
35 example, as described *supra*). In specific embodiments, antibodies are provided that inhibit ligand activity or receptor activity by at least 95%, at least 90%, at least 85%, at least 80%, at least 75%, at least 70%, at least 60%, or at least 50% of the activity in absence of the antibody.

The invention also features receptor-specific antibodies which both prevent ligand binding and receptor activation as well as antibodies that recognize the receptor-ligand complex, and, preferably, do not specifically recognize the unbound receptor or the unbound ligand. Likewise, included in the invention are neutralizing antibodies which bind the ligand and prevent binding of the ligand to the receptor, as well as antibodies which bind the ligand, thereby preventing receptor activation, but do not prevent the ligand from binding the receptor. Further included in the invention are antibodies which activate the receptor. These antibodies may act as receptor agonists, i.e., potentiate or activate either all or a subset of the biological activities of the ligand-mediated receptor activation, for example, by inducing dimerization of the receptor. The antibodies may be specified as agonists, antagonists or inverse agonists for biological activities comprising the specific biological activities of the peptides of the invention disclosed herein. The above antibody agonists can be made using methods known in the art. See, e.g., PCT publication WO 96/40281; U.S. Patent No. 5,811,097; Deng et al., Blood 92(6):1981-1988 (1998); Chen et al., Cancer Res. 58(16):3668-3678 (1998); Harrop et al., J. Immunol. 161(4):1786-1794 (1998); Zhu et al., Cancer Res. 58(15):3209-3214 (1998); Yoon et al., J. Immunol. 160(7):3170-3179 (1998); Prat et al., J. Cell. Sci. 111(Pt2):237-247 (1998); Pitard et al., J. Immunol. Methods 205(2):177-190 (1997); Liautard et al., Cytokine 9(4):233-241 (1997); Carlson et al., J. Biol. Chem. 272(17):11295-11301 (1997); Taryman et al., Neuron 14(4):755-762 (1995); Muller et al., Structure 6(9):1153-1167 (1998); Bartunek et al., Cytokine 8(1):14-20 (1996) (which are all incorporated by reference herein in their entireties).

Antibodies of the present invention may be used, for example, to purify, detect, and target the polypeptides of the present invention, including both *in vitro* and *in vivo* diagnostic and therapeutic methods. For example, the antibodies have utility in immunoassays for qualitatively and quantitatively measuring levels of the polypeptides of the present invention in biological samples. See, e.g., Harlow et al., Antibodies: A Laboratory Manual, (Cold Spring Harbor Laboratory Press, 2nd ed. 1988); incorporated by reference herein in its entirety.

As discussed in more detail below, the antibodies of the present invention may be used either alone or in combination with other compositions. The antibodies may further be recombinantly fused to a heterologous polypeptide at the N- or C-terminus or chemically conjugated (including covalent and non-covalent conjugations) to polypeptides or other compositions. For example, antibodies of the present invention may be recombinantly fused or conjugated to molecules useful as labels in detection assays and effector molecules such as heterologous polypeptides, drugs, radionuclides, or toxins. See, e.g., PCT publications WO 92/08495; WO 91/14438; WO 89/12624; U.S. Patent No. 5,314,995; and EP 396,387; the disclosures of which are incorporated herein by reference in their entireties.



The antibodies of the invention include derivatives that are modified, i.e., by the covalent attachment of any type of molecule to the antibody such that covalent attachment does not prevent the antibody from generating an anti-idiotypic response. For example, but not by way of limitation, the antibody derivatives include antibodies that have been modified, e.g., by glycosylation, acetylation, pegylation, phosphorylation, amidation, derivatization by known protecting/blocking groups, proteolytic cleavage, linkage to a cellular ligand or other protein, etc. Any of numerous chemical modifications may be carried out by known techniques, including, but not limited to specific chemical cleavage, acetylation, formylation, metabolic synthesis of tunicamycin, etc. Additionally, the derivative may contain one or more non-classical amino acids.

10 The antibodies of the present invention may be generated by any suitable method known in the art. Polyclonal antibodies to an antigen-of-interest can be produced by various procedures well known in the art. For example, a polypeptide of the invention can be administered to various host animals including, but not limited to, rabbits, mice, rats, etc. to induce the production of sera containing polyclonal antibodies specific for the antigen. Various adjuvants 15 may be used to increase the immunological response, depending on the host species, and include but are not limited to, Freund's (complete and incomplete), mineral gels such as aluminum hydroxide, surface active substances such as lysolecithin, pluronic polyols, polyanions, peptides, oil emulsions, keyhole limpet hemocyanins, dinitrophenol, and potentially useful human adjuvants such as BCG (bacille Calmette-Guerin) and corynebacterium parvum. Such adjuvants are also 20 well known in the art.

Monoclonal antibodies can be prepared using a wide variety of techniques known in the art including the use of hybridoma, recombinant, and phage display technologies, or a combination thereof. For example, monoclonal antibodies can be produced using hybridoma techniques including those known in the art and taught, for example, in Harlow et al., *Antibodies: A Laboratory Manual*, (Cold Spring Harbor Laboratory Press, 2nd ed. 1988); Hammerling, et al., in: *Monoclonal Antibodies and T-Cell Hybridomas* 563-681 (Elsevier, N.Y., 1981) (said references incorporated by reference in their entireties). The term "monoclonal antibody" as used herein is not limited to antibodies produced through hybridoma technology. The term "monoclonal antibody" refers to an antibody that is derived from a single clone, including any 25 eukaryotic, prokaryotic, or phage clone, and not the method by which it is produced. 30

Methods for producing and screening for specific antibodies using hybridoma technology are routine and well known in the art and are discussed in detail in the Examples. In a non-limiting example, mice can be immunized with a polypeptide of the invention or a cell expressing such peptide. Once an immune response is detected, e.g., antibodies specific for the 35 antigen are detected in the mouse serum, the mouse spleen is harvested and splenocytes isolated. The splenocytes are then fused by well known techniques to any suitable myeloma cells, for

example cells from cell line SP20 available from the ATCC. Hybridomas are selected and cloned by limited dilution. The hybridoma clones are then assayed by methods known in the art for cells that secrete antibodies capable of binding a polypeptide of the invention. Ascites fluid, which generally contains high levels of antibodies, can be generated by immunizing mice with positive  
5 hybridoma clones.

Accordingly, the present invention provides methods of generating monoclonal antibodies as well as antibodies produced by the method comprising culturing a hybridoma cell secreting an antibody of the invention wherein, preferably, the hybridoma is generated by fusing splenocytes isolated from a mouse immunized with an antigen of the invention with myeloma cells  
10 and then screening the hybridomas resulting from the fusion for hybridoma clones that secrete an antibody able to bind a polypeptide of the invention.

Another well known method for producing both polyclonal and monoclonal human B cell lines is transformation using Epstein Barr Virus (EBV). Protocols for generating EBV-transformed B cell lines are commonly known in the art, such as, for example, the protocol outlined in Chapter 7.22 of Current Protocols in Immunology, Coligan et al., Eds., 1994, John Wiley & Sons, NY, which is hereby incorporated in its entirety by reference. The source of B  
15 cells for transformation is commonly human peripheral blood, but B cells for transformation may also be derived from other sources including, but not limited to, lymph nodes, tonsil, spleen, tumor tissue, and infected tissues. Tissues are generally made into single cell suspensions prior to EBV transformation. Additionally, steps may be taken to either physically remove or inactivate T cells (e.g., by treatment with cyclosporin A) in B cell-containing samples, because T cells from  
20 individuals seropositive for anti-EBV antibodies can suppress B cell immortalization by EBV.

In general, the sample containing human B cells is inoculated with EBV, and cultured for 3-4 weeks. A typical source of EBV is the culture supernatant of the B95-8 cell line  
25 (ATCC #VR-1492). Physical signs of EBV transformation can generally be seen towards the end of the 3-4 week culture period. By phase-contrast microscopy, transformed cells may appear large, clear, hairy and tend to aggregate in tight clusters of cells. Initially, EBV lines are generally polyclonal. However, over prolonged periods of cell cultures, EBV lines may become monoclonal or polyclonal as a result of the selective outgrowth of particular B cell clones. Alternatively,  
30 polyclonal EBV transformed lines may be subcloned (e.g., by limiting dilution culture) or fused with a suitable fusion partner and plated at limiting dilution to obtain monoclonal B cell lines. Suitable fusion partners for EBV transformed cell lines include mouse myeloma cell lines (e.g., SP2/0, X63-Ag8.653), heteromyeloma cell lines (human x mouse; e.g., SPAM-8, SBC-H20, and CB-F7), and human cell lines (e.g., GM 1500, SKO-007, RPMI 8226, and KR-4). Thus, the  
35 present invention also provides a method of generating polyclonal or monoclonal human

antibodies against polypeptides of the invention or fragments thereof, comprising EBV-transformation of human B cells.

Antibody fragments which recognize specific epitopes may be generated by known techniques. For example, Fab and F(ab')<sub>2</sub> fragments of the invention may be produced by  
5 proteolytic cleavage of immunoglobulin molecules, using enzymes such as papain (to produce Fab fragments) or pepsin (to produce F(ab')<sub>2</sub> fragments). F(ab')<sub>2</sub> fragments contain the variable region, the light chain constant region and the CH1 domain of the heavy chain.

For example, the antibodies of the present invention can also be generated using various phage display methods known in the art. In phage display methods, functional antibody  
10 domains are displayed on the surface of phage particles which carry the polynucleotide sequences encoding them. In a particular embodiment, such phage can be utilized to display antigen binding domains expressed from a repertoire or combinatorial antibody library (e.g., human or murine). Phage expressing an antigen binding domain that binds the antigen of interest can be selected or identified with antigen, e.g., using labeled antigen or antigen bound or captured to a solid surface  
15 or bead. Phage used in these methods are typically filamentous phage including fd and M13 binding domains expressed from phage with Fab, Fv or disulfide stabilized Fv antibody domains recombinantly fused to either the phage gene III or gene VIII protein. Examples of phage display methods that can be used to make the antibodies of the present invention include those disclosed in Brinkman et al., J. Immunol. Methods 182:41-50 (1995); Ames et al., J. Immunol. Methods  
20 184:177-186 (1995); Kettleborough et al., Eur. J. Immunol. 24:952-958 (1994); Persic et al., Gene 187 9-18 (1997); Burton et al., Advances in Immunology 57:191-280 (1994); PCT application No. PCT/GB91/01134; PCT publications WO 90/02809; WO 91/10737; WO 92/01047; WO 92/18619; WO 93/11236; WO 95/15982; WO 95/20401; and U.S. Patent Nos. 5,698,426; 5,223,409; 5,403,484; 5,580,717; 5,427,908; 5,750,753; 5,821,047; 5,571,698; 5,427,908;  
25 5,516,637; 5,780,225; 5,658,727; 5,733,743 and 5,969,108; each of which is incorporated herein by reference in its entirety.

As described in the above references, after phage selection, the antibody coding regions from the phage can be isolated and used to generate whole antibodies, including human antibodies, or any other desired antigen binding fragment, and expressed in any desired host,  
30 including mammalian cells, insect cells, plant cells, yeast, and bacteria, e.g., as described in detail below. For example, techniques to recombinantly produce Fab, Fab' and F(ab')<sub>2</sub> fragments can also be employed using methods known in the art such as those disclosed in PCT publication WO 92/22324; Mullinax et al., BioTechniques 12(6):864-869 (1992); and Sawai et al., AJRI 34:26-34 (1995); and Better et al., Science 240:1041-1043 (1988) (said references incorporated by reference  
35 in their entireties).

Examples of techniques which can be used to produce single-chain Fvs and antibodies include those described in U.S. Patents 4,946,778 and 5,258,498; Huston et al., *Methods in Enzymology* 203:46-88 (1991); Shu et al., *PNAS* 90:7995-7999 (1993); and Skerra et al., *Science* 240:1038-1040 (1988). For some uses, including *in vivo* use of antibodies in humans and *in vitro* detection assays, it may be preferable to use chimeric, humanized, or human antibodies. A chimeric antibody is a molecule in which different portions of the antibody are derived from different animal species, such as antibodies having a variable region derived from a murine monoclonal antibody and a human immunoglobulin constant region. Methods for producing chimeric antibodies are known in the art. See e.g., Morrison, *Science* 229:1202 (1985); Oi et al., *BioTechniques* 4:214 (1986); Gillies et al., (1989) *J. Immunol. Methods* 125:191-202; U.S. Patent Nos. 5,807,715; 4,816,567; and 4,816,397, which are incorporated herein by reference in their entirety. Humanized antibodies are antibody molecules from non-human species antibody that binds the desired antigen having one or more complementarity determining regions (CDRs) from the non-human species and a framework region from a human immunoglobulin molecule. Often, framework residues in the human framework regions will be substituted with the corresponding residue from the CDR donor antibody to alter, preferably improve, antigen binding. These framework substitutions are identified by methods well known in the art, e.g., by modeling of the interactions of the CDR and framework residues to identify framework residues important for antigen binding and sequence comparison to identify unusual framework residues at particular positions. (See, e.g., Queen et al., U.S. Patent No. 5,585,089; Riechmann et al., *Nature* 332:323 (1988), which are incorporated herein by reference in their entireties.) Antibodies can be humanized using a variety of techniques known in the art including, for example, CDR-grafting (EP 239,400; PCT publication WO 91/09967; U.S. Patent Nos. 5,225,539; 5,530,101; and 5,585,089), veneering or resurfacing (EP 592,106; EP 519,596; Padlan, *Molecular Immunology* 28(4/5):489-498 (1991); Studnicka et al., *Protein Engineering* 7(6):805-814 (1994); Roguska et al., *PNAS* 91:969-973 (1994)), and chain shuffling (U.S. Patent No. 5,565,332).

Completely human antibodies are particularly desirable for therapeutic treatment of human patients. Human antibodies can be made by a variety of methods known in the art including phage display methods described above using antibody libraries derived from human immunoglobulin sequences. See also, U.S. Patent Nos. 4,444,887 and 4,716,111; and PCT publications WO 98/46645, WO 98/50433, WO 98/24893, WO 98/16654, WO 96/34096, WO 96/33735, and WO 91/10741; each of which is incorporated herein by reference in its entirety.

Human antibodies can also be produced using transgenic mice which are incapable of expressing functional endogenous immunoglobulins, but which can express human immunoglobulin genes. For example, the human heavy and light chain immunoglobulin gene complexes may be introduced randomly or by homologous recombination into mouse embryonic

stem cells. Alternatively, the human variable region, constant region, and diversity region may be introduced into mouse embryonic stem cells in addition to the human heavy and light chain genes. The mouse heavy and light chain immunoglobulin genes may be rendered non-functional separately or simultaneously with the introduction of human immunoglobulin loci by homologous recombination. In particular, homozygous deletion of the JH region prevents endogenous antibody production. The modified embryonic stem cells are expanded and microinjected into blastocysts to produce chimeric mice. The chimeric mice are then bred to produce homozygous offspring which express human antibodies. The transgenic mice are immunized in the normal fashion with a selected antigen, e.g., all or a portion of a polypeptide of the invention. Monoclonal antibodies directed against the antigen can be obtained from the immunized, transgenic mice using conventional hybridoma technology. The human immunoglobulin transgenes harbored by the transgenic mice rearrange during B cell differentiation, and subsequently undergo class switching and somatic mutation. Thus, using such a technique, it is possible to produce therapeutically useful IgG, IgA, IgM and IgE antibodies. For an overview of this technology for producing human antibodies, see Lonberg and Huszar, *Int. Rev. Immunol.* 13:65-93 (1995). For a detailed discussion of this technology for producing human antibodies and human monoclonal antibodies and protocols for producing such antibodies, see, e.g., PCT publications WO 98/24893; WO 92/01047; WO 96/34096; WO 96/33735; European Patent No. 0 598 877; U.S. Patent Nos. 5,413,923; 5,625,126; 5,633,425; 5,569,825; 5,661,016; 5,545,806; 5,814,318; 5,885,793; 5,916,771; 5,939,598; 6,075,181; and 6,114,598, which are incorporated by reference herein in their entirety. In addition, companies such as Abgenix, Inc. (Freemont, CA) and Genpharm (San Jose, CA) can be engaged to provide human antibodies directed against a selected antigen using technology similar to that described above.

Completely human antibodies which recognize a selected epitope can be generated using a technique referred to as "guided selection." In this approach a selected non-human monoclonal antibody, e.g., a mouse antibody, is used to guide the selection of a completely human antibody recognizing the same epitope. (Jespers et al., *Bio/technology* 12:899-903 (1988)).

Further, antibodies to the polypeptides of the invention can, in turn, be utilized to generate anti-idiotypic antibodies that "mimic" polypeptides of the invention using techniques well known to those skilled in the art. (See, e.g., Greenspan & Bona, *FASEB J.* 7(5):437-444; (1989) and Nissinoff, *J. Immunol.* 147(8):2429-2438 (1991)). For example, antibodies which bind to and competitively inhibit polypeptide multimerization and/or binding of a polypeptide of the invention to a ligand can be used to generate anti-idiotypes that "mimic" the polypeptide multimerization and/or binding domain and, as a consequence, bind to and neutralize polypeptide and/or its ligand. Such neutralizing anti-idiotypes or Fab fragments of such anti-idiotypes can be used in therapeutic regimens to neutralize polypeptide ligand(s)/receptor(s). For example, such anti-idiotypic antibodies can be used to bind a polypeptide of the invention and/or to bind its

ligand(s)/receptor(s), and thereby block its biological activity. Alternatively, antibodies which bind to and enhance polypeptide multimerization and/or binding, and/or receptor/ligand multimerization, binding and/or signaling can be used to generate anti-idiotypes that function as agonists of a polypeptide of the invention and/or its ligand/receptor. Such agonistic anti-idiotypes or Fab fragments of such anti-idiotypes can be used in therapeutic regimens as agonists of the polypeptides of the invention or its ligand(s)/receptor(s). For example, such anti-idiotypic antibodies can be used to bind a polypeptide of the invention and/or to bind its ligand(s)/receptor(s), and thereby promote or enhance its biological activity.

Intrabodies of the invention can be produced using methods known in the art, such as those disclosed and reviewed in Chen et al., Hum. Gene Ther. 5:595-601 (1994); Marasco, W.A., Gene Ther. 4:11-15 (1997); Rondon and Marasco, Annu. Rev. Microbiol. 51:257-283 (1997); Proba et al., J. Mol. Biol. 275:245-253 (1998); Cohen et al., Oncogene 17:2445-2456 (1998); Ohage and Steipe, J. Mol. Biol. 291:1119-1128 (1999); Ohage et al., J. Mol. Biol. 291:1129-1134 (1999); Wirtz and Steipe, Protein Sci. 8:2245-2250 (1999); Zhu et al., J. Immunol. Methods 15 231:207-222 (1999); and references cited therein.

#### *Polynucleotides Encoding Antibodies*

The invention further provides polynucleotides comprising a nucleotide sequence encoding an antibody of the invention and fragments thereof. The invention also encompasses polynucleotides that hybridize under stringent or alternatively, under lower stringency hybridization conditions, e.g., as defined *supra*, to polynucleotides that encode an antibody, preferably, that specifically binds to a polypeptide of the invention, preferably, an antibody that binds to a polypeptide having the amino acid sequence of SEQ ID NO:Y, to a polypeptide encoded by a portion of SEQ ID NO:X as defined in columns 8 and 9 of Table 2, and/or to a polypeptide encoded by the cDNA contained in ATCC Deposit No:Z.

The polynucleotides may be obtained, and the nucleotide sequence of the polynucleotides determined, by any method known in the art. For example, if the nucleotide sequence of the antibody is known, a polynucleotide encoding the antibody may be assembled from chemically synthesized oligonucleotides (e.g., as described in Kutmeier et al., BioTechniques 17:242 (1994)), which, briefly, involves the synthesis of overlapping oligonucleotides containing portions of the sequence encoding the antibody, annealing and ligating of those oligonucleotides, and then amplification of the ligated oligonucleotides by PCR.

Alternatively, a polynucleotide encoding an antibody may be generated from nucleic acid from a suitable source. If a clone containing a nucleic acid encoding a particular antibody is not available, but the sequence of the antibody molecule is known, a nucleic acid encoding the immunoglobulin may be chemically synthesized or obtained from a suitable source (e.g., an

antibody cDNA library, or a cDNA library generated from, or nucleic acid, preferably poly A+ RNA, isolated from, any tissue or cells expressing the antibody, such as hybridoma cells selected to express an antibody of the invention) by PCR amplification using synthetic primers hybridizable to the 3' and 5' ends of the sequence or by cloning using an oligonucleotide probe specific for the particular gene sequence to identify, e.g., a cDNA clone from a cDNA library that encodes the antibody. Amplified nucleic acids generated by PCR may then be cloned into replicable cloning vectors using any method well known in the art.

Once the nucleotide sequence and corresponding amino acid sequence of the antibody is determined, the nucleotide sequence of the antibody may be manipulated using methods well known in the art for the manipulation of nucleotide sequences, e.g., recombinant DNA techniques, site directed mutagenesis, PCR, etc. (see, for example, the techniques described in Sambrook et al., 1990, Molecular Cloning, A Laboratory Manual, 2d Ed., Cold Spring Harbor Laboratory, Cold Spring Harbor, NY and Ausubel et al., eds., 1998, Current Protocols in Molecular Biology, John Wiley & Sons, NY, which are both incorporated by reference herein in their entireties), to generate antibodies having a different amino acid sequence, for example to create amino acid substitutions, deletions, and/or insertions.

In a specific embodiment, the amino acid sequence of the heavy and/or light chain variable domains may be inspected to identify the sequences of the complementarity determining regions (CDRs) by methods that are well known in the art, e.g., by comparison to known amino acid sequences of other heavy and light chain variable regions to determine the regions of sequence hypervariability. Using routine recombinant DNA techniques, one or more of the CDRs may be inserted within framework regions, e.g., into human framework regions to humanize a non-human antibody, as described *supra*. The framework regions may be naturally occurring or consensus framework regions, and preferably human framework regions (see, e.g., Chothia et al., J. Mol. Biol. 278: 457-479 (1998) for a listing of human framework regions). Preferably, the polynucleotide generated by the combination of the framework regions and CDRs encodes an antibody that specifically binds a polypeptide of the invention. Preferably, as discussed *supra*, one or more amino acid substitutions may be made within the framework regions, and, preferably, the amino acid substitutions improve binding of the antibody to its antigen. Additionally, such methods may be used to make amino acid substitutions or deletions of one or more variable region cysteine residues participating in an intrachain disulfide bond to generate antibody molecules lacking one or more intrachain disulfide bonds. Other alterations to the polynucleotide are encompassed by the present invention and within the skill of the art.

In addition, techniques developed for the production of "chimeric antibodies" (Morrison et al., Proc. Natl. Acad. Sci. 81:851-855 (1984); Neuberger et al., Nature 312:604-608 (1984); Takeda et al., Nature 314:452-454 (1985)) by splicing genes from a mouse antibody

molecule of appropriate antigen specificity together with genes from a human antibody molecule of appropriate biological activity can be used. As described *supra*, a chimeric antibody is a molecule in which different portions are derived from different animal species, such as those having a variable region derived from a murine mAb and a human immunoglobulin constant region, e.g., humanized antibodies.

Alternatively, techniques described for the production of single chain antibodies (U.S. Patent No. 4,946,778; Bird, Science 242:423-42 (1988); Huston et al., Proc. Natl. Acad. Sci. USA 85:5879-5883 (1988); and Ward et al., Nature 334:544-54 (1989)) can be adapted to produce single chain antibodies. Single chain antibodies are formed by linking the heavy and light chain fragments of the Fv region via an amino acid bridge, resulting in a single chain polypeptide. Techniques for the assembly of functional Fv fragments in *E. coli* may also be used (Skerra et al., Science 242:1038-1041 (1988)).

#### *Methods of Producing Antibodies*

The antibodies of the invention can be produced by any method known in the art for the synthesis of antibodies, in particular, by chemical synthesis or preferably, by recombinant expression techniques. Methods of producing antibodies include, but are not limited to, hybridoma technology, EBV transformation, and other methods discussed herein as well as through the use of recombinant DNA technology, as discussed below.

Recombinant expression of an antibody of the invention, or fragment, derivative or analog thereof, (e.g., a heavy or light chain of an antibody of the invention or a single chain antibody of the invention), requires construction of an expression vector containing a polynucleotide that encodes the antibody. Once a polynucleotide encoding an antibody molecule or a heavy or light chain of an antibody, or portion thereof (preferably containing the heavy or light chain variable domain), of the invention has been obtained, the vector for the production of the antibody molecule may be produced by recombinant DNA technology using techniques well known in the art. Thus, methods for preparing a protein by expressing a polynucleotide containing an antibody encoding nucleotide sequence are described herein. Methods which are well known to those skilled in the art can be used to construct expression vectors containing antibody coding sequences and appropriate transcriptional and translational control signals. These methods include, for example, *in vitro* recombinant DNA techniques, synthetic techniques, and *in vivo* genetic recombination. The invention, thus, provides replicable vectors comprising a nucleotide sequence encoding an antibody molecule of the invention, or a heavy or light chain thereof, or a heavy or light chain variable domain, operably linked to a promoter. Such vectors may include the nucleotide sequence encoding the constant region of the antibody molecule (see, e.g., PCT Publication WO 86/05807; PCT Publication WO 89/01036; and U.S. Patent No. 5,122,464) and



the variable domain of the antibody may be cloned into such a vector for expression of the entire heavy or light chain.

The expression vector is transferred to a host cell by conventional techniques and the transfected cells are then cultured by conventional techniques to produce an antibody of the invention. Thus, the invention includes host cells containing a polynucleotide encoding an antibody of the invention, or a heavy or light chain thereof, or a single chain antibody of the invention, operably linked to a heterologous promoter. In preferred embodiments for the expression of double-chained antibodies, vectors encoding both the heavy and light chains may be co-expressed in the host cell for expression of the entire immunoglobulin molecule, as detailed below.

A variety of host-expression vector systems may be utilized to express the antibody molecules of the invention. Such host-expression systems represent vehicles by which the coding sequences of interest may be produced and subsequently purified, but also represent cells which may, when transformed or transfected with the appropriate nucleotide coding sequences, express an antibody molecule of the invention in situ. These include but are not limited to microorganisms such as bacteria (e.g., *E. coli*, *B. subtilis*) transformed with recombinant bacteriophage DNA, plasmid DNA or cosmid DNA expression vectors containing antibody coding sequences; yeast (e.g., *Saccharomyces*, *Pichia*) transformed with recombinant yeast expression vectors containing antibody coding sequences; insect cell systems infected with recombinant virus expression vectors (e.g., baculovirus) containing antibody coding sequences; plant cell systems infected with recombinant virus expression vectors (e.g., cauliflower mosaic virus, CaMV; tobacco mosaic virus, TMV) or transformed with recombinant plasmid expression vectors (e.g., Ti plasmid) containing antibody coding sequences; or mammalian cell systems (e.g., COS, CHO, BHK, 293, 3T3 cells) harboring recombinant expression constructs containing promoters derived from the genome of mammalian cells (e.g., metallothionein promoter) or from mammalian viruses (e.g., the adenovirus late promoter; the vaccinia virus 7.5K promoter). Preferably, bacterial cells such as *Escherichia coli*, and more preferably, eukaryotic cells, especially for the expression of whole recombinant antibody molecule, are used for the expression of a recombinant antibody molecule. For example, mammalian cells such as Chinese hamster ovary cells (CHO), in conjunction with a vector such as the major intermediate early gene promoter element from human cytomegalovirus is an effective expression system for antibodies (Foecking et al., *Gene* 45:101 (1986); Cockett et al., *Bio/Technology* 8:2 (1990)).

In bacterial systems, a number of expression vectors may be advantageously selected depending upon the use intended for the antibody molecule being expressed. For example, when a large quantity of such a protein is to be produced, for the generation of pharmaceutical compositions of an antibody molecule, vectors which direct the expression of high levels of fusion

protein products that are readily purified may be desirable. Such vectors include, but are not limited, to the *E. coli* expression vector pUR278 (Ruther et al., EMBO J. 2:1791 (1983)), in which the antibody coding sequence may be ligated individually into the vector in frame with the lac Z coding region so that a fusion protein is produced; pIN vectors (Inouye & Inouye, Nucleic Acids Res. 13:3101-3109 (1985); Van Heeke & Schuster, J. Biol. Chem. 24:5503-5509 (1989)); and the like. pGEX vectors may also be used to express foreign polypeptides as fusion proteins with glutathione S-transferase (GST). In general, such fusion proteins are soluble and can easily be purified from lysed cells by adsorption and binding to matrix glutathione-agarose beads followed by elution in the presence of free glutathione. The pGEX vectors are designed to include thrombin or factor Xa protease cleavage sites so that the cloned target gene product can be released from the GST moiety.

In an insect system, Autographa californica nuclear polyhedrosis virus (AcNPV) is used as a vector to express foreign genes. The virus grows in *Spodoptera frugiperda* cells. The antibody coding sequence may be cloned individually into non-essential regions (for example the polyhedrin gene) of the virus and placed under control of an AcNPV promoter (for example the polyhedrin promoter).

In mammalian host cells, a number of viral-based expression systems may be utilized. In cases where an adenovirus is used as an expression vector, the antibody coding sequence of interest may be ligated to an adenovirus transcription/translation control complex, e.g., the late promoter and tripartite leader sequence. This chimeric gene may then be inserted in the adenovirus genome by *in vitro* or *in vivo* recombination. Insertion in a non-essential region of the viral genome (e.g., region E1 or E3) will result in a recombinant virus that is viable and capable of expressing the antibody molecule in infected hosts. (e.g., see Logan & Shenk, Proc. Natl. Acad. Sci. USA 81:355-359 (1984)). Specific initiation signals may also be required for efficient translation of inserted antibody coding sequences. These signals include the ATG initiation codon and adjacent sequences. Furthermore, the initiation codon must be in phase with the reading frame of the desired coding sequence to ensure translation of the entire insert. These exogenous translational control signals and initiation codons can be of a variety of origins, both natural and synthetic. The efficiency of expression may be enhanced by the inclusion of appropriate transcription enhancer elements, transcription terminators, etc. (see Bittner et al., Methods in Enzymol. 153:51-544 (1987)).

In addition, a host cell strain may be chosen which modulates the expression of the inserted sequences, or modifies and processes the gene product in the specific fashion desired. Such modifications (e.g., glycosylation) and processing (e.g., cleavage) of protein products may be important for the function of the protein. Different host cells have characteristic and specific mechanisms for the post-translational processing and modification of proteins and gene products.

Appropriate cell lines or host systems can be chosen to ensure the correct modification and processing of the foreign protein expressed. To this end, eukaryotic host cells which possess the cellular machinery for proper processing of the primary transcript, glycosylation, and phosphorylation of the gene product may be used. Such mammalian host cells include but are not limited to CHO, VERY, BHK, Hela, COS, MDCK, 293, 3T3, WI38, and in particular, breast cancer cell lines such as, for example, BT483, Hs578T, HTB2, BT20 and T47D, and normal mammary gland cell line such as, for example, CRL7030 and Hs578Bst.

For long-term, high-yield production of recombinant proteins, stable expression is preferred. For example, cell lines which stably express the antibody molecule may be engineered. Rather than using expression vectors which contain viral origins of replication, host cells can be transformed with DNA controlled by appropriate expression control elements (e.g., promoter, enhancer, sequences, transcription terminators, polyadenylation sites, etc.), and a selectable marker. Following the introduction of the foreign DNA, engineered cells may be allowed to grow for 1-2 days in an enriched media, and then are switched to a selective media. The selectable marker in the recombinant plasmid confers resistance to the selection and allows cells to stably integrate the plasmid into their chromosomes and grow to form foci that in turn can be cloned and expanded into cell lines. This method may advantageously be used to engineer cell lines which express the antibody molecule. Such engineered cell lines may be particularly useful in screening and evaluation of compounds that interact directly or indirectly with the antibody molecule.

A number of selection systems may be used, including but not limited to the herpes simplex virus thymidine kinase (Wigler et al., Cell 11:223 (1977)), hypoxanthine-guanine phosphoribosyltransferase (Szybalska & Szybalski, Proc. Natl. Acad. Sci. USA 48:202 (1992)), and adenine phosphoribosyltransferase (Lowy et al., Cell 22:817 (1980)) genes can be employed in tk-, hgprt- or aprt- cells, respectively. Also, antimetabolite resistance can be used as the basis of selection for the following genes: dhfr, which confers resistance to methotrexate (Wigler et al., Natl. Acad. Sci. USA 77:357 (1980); O'Hare et al., Proc. Natl. Acad. Sci. USA 78:1527 (1981)); gpt, which confers resistance to mycophenolic acid (Mulligan & Berg, Proc. Natl. Acad. Sci. USA 78:2072 (1981)); neo, which confers resistance to the aminoglycoside G-418 Clinical Pharmacy 12:488-505; Wu and Wu, Biotherapy 3:87-95 (1991); Tolstoshev, Ann. Rev. Pharmacol. Toxicol. 32:573-596 (1993); Mulligan, Science 260:926-932 (1993); and Morgan and Anderson, Ann. Rev. Biochem. 62:191-217 (1993); May, 1993, TIB TECH 11(5):155-215 (1993)); and hygromycin (Santerre et al., Gene 30:147 (1984)). Methods commonly known in the art of recombinant DNA technology may be routinely applied to select the desired recombinant clone, and such methods are described, for example, in Ausubel et al. (eds.), Current Protocols in Molecular Biology, John Wiley & Sons, NY (1993); Kriegler, Gene Transfer and Expression, A Laboratory Manual, Stockton Press, NY (1990); and in Chapters 12 and 13, Dracopoli et al. (eds.), Current Protocols in Human Genetics, John Wiley & Sons, NY (1994);

Colberre-Garapin et al., J. Mol. Biol. 150:1 (1981), which are incorporated by reference herein in their entireties.

The expression levels of an antibody molecule can be increased by vector amplification (for a review, see Bebbington and Hentschel, The use of vectors based on gene amplification for the expression of cloned genes in mammalian cells in DNA cloning, Vol.3. (Academic Press, New York, 1987)). When a marker in the vector system expressing antibody is amplifiable, increase in the level of inhibitor present in culture of host cell will increase the number of copies of the marker gene. Since the amplified region is associated with the antibody gene, production of the antibody will also increase (Crouse et al., Mol. Cell. Biol. 3:257 (1983)).

Vectors which use glutamine synthase (GS) or DHFR as the selectable markers can be amplified in the presence of the drugs methionine sulfoximine or methotrexate, respectively. An advantage of glutamine synthase based vectors are the availability of cell lines (e.g., the murine myeloma cell line, NS0) which are glutamine synthase negative. Glutamine synthase expression systems can also function in glutamine synthase expressing cells (e.g. Chinese Hamster Ovary (CHO) cells) by providing additional inhibitor to prevent the functioning of the endogenous gene. A glutamine synthase expression system and components thereof are detailed in PCT publications: WO87/04462; WO86/05807; WO89/01036; WO89/10404; and WO91/06657 which are incorporated in their entireties by reference herein. Additionally, glutamine synthase expression vectors that may be used according to the present invention are commercially available from suppliers, including, for example Lonza Biologics, Inc. (Portsmouth, NH). Expression and production of monoclonal antibodies using a GS expression system in murine myeloma cells is described in Bebbington *et al.*, *Bio/technology* 10:169(1992) and in Biblia and Robinson *Biotechnol. Prog.* 11:1 (1995) which are incorporated in their entireties by reference herein.

The host cell may be co-transfected with two expression vectors of the invention, the first vector encoding a heavy chain derived polypeptide and the second vector encoding a light chain derived polypeptide. The two vectors may contain identical selectable markers which enable equal expression of heavy and light chain polypeptides. Alternatively, a single vector may be used which encodes, and is capable of expressing, both heavy and light chain polypeptides. In such situations, the light chain should be placed before the heavy chain to avoid an excess of toxic free heavy chain (Proudfoot, *Nature* 322:52 (1986); Kohler, *Proc. Natl. Acad. Sci. USA* 77:2197 (1980)). The coding sequences for the heavy and light chains may comprise cDNA or genomic DNA.

Once an antibody molecule of the invention has been produced by an animal, chemically synthesized, or recombinantly expressed, it may be purified by any method known in the art for purification of an immunoglobulin molecule, for example, by chromatography (e.g., ion exchange, affinity, particularly by affinity for the specific antigen after Protein A, and sizing

column chromatography), centrifugation, differential solubility, or by any other standard technique for the purification of proteins. In addition, the antibodies of the present invention or fragments thereof can be fused to heterologous polypeptide sequences described herein or otherwise known in the art, to facilitate purification.

5           The present invention encompasses antibodies recombinantly fused or chemically conjugated (including both covalently and non-covalently conjugations) to a polypeptide (or portion thereof, preferably at least 10, 20, 30, 40, 50, 60, 70, 80, 90 or 100 amino acids of the polypeptide) of the present invention to generate fusion proteins. The fusion does not necessarily need to be direct, but may occur through linker sequences. The antibodies may be specific for  
10   antigens other than polypeptides (or portion thereof, preferably at least 10, 20, 30, 40, 50, 60, 70, 80, 90 or 100 amino acids of the polypeptide) of the present invention. For example, antibodies may be used to target the polypeptides of the present invention to particular cell types, either in vitro or *in vivo*, by fusing or conjugating the polypeptides of the present invention to antibodies specific for particular cell surface receptors. Antibodies fused or conjugated to the polypeptides of  
15   the present invention may also be used in in vitro immunoassays and purification methods using methods known in the art. See e.g., Harbor et al., *supra*, and PCT publication WO 93/21232; EP 439,095; Naramura et al., *Immunol. Lett.* 39:91-99 (1994); U.S. Patent 5,474,981; Gillies et al., *PNAS* 89:1428-1432 (1992); Fell et al., *J. Immunol.* 146:2446-2452 (1991), which are incorporated by reference in their entireties.

20           The present invention further includes compositions comprising the polypeptides of the present invention fused or conjugated to antibody domains other than the variable regions. For example, the polypeptides of the present invention may be fused or conjugated to an antibody Fc region, or portion thereof. The antibody portion fused to a polypeptide of the present invention may comprise the constant region, hinge region, CH1 domain, CH2 domain, and CH3 domain or  
25   any combination of whole domains or portions thereof. The polypeptides may also be fused or conjugated to the above antibody portions to form multimers. For example, Fc portions fused to the polypeptides of the present invention can form dimers through disulfide bonding between the Fc portions. Higher multimeric forms can be made by fusing the polypeptides to portions of IgA and IgM. Methods for fusing or conjugating the polypeptides of the present invention to antibody  
30   portions are known in the art. See, e.g., U.S. Patent Nos. 5,336,603; 5,622,929; 5,359,046; 5,349,053; 5,447,851; 5,112,946; EP 307,434; EP 367,166; PCT publications WO 96/04388; WO 91/06570; Ashkenazi et al., *Proc. Natl. Acad. Sci. USA* 88:10535-10539 (1991); Zheng et al., *J. Immunol.* 154:5590-5600 (1995); and Vil et al., *Proc. Natl. Acad. Sci. USA* 89:11337- 11341 (1992) (said references incorporated by reference in their entireties).

35           As discussed, *supra*, the polypeptides corresponding to a polypeptide, polypeptide fragment, or a variant of SEQ ID NO:Y may be fused or conjugated to the above antibody portions

to increase the *in vivo* half life of the polypeptides or for use in immunoassays using methods known in the art. Further, the polypeptides corresponding to SEQ ID NO:Y may be fused or conjugated to the above antibody portions to facilitate purification. One reported example describes chimeric proteins consisting of the first two domains of the human CD4-polypeptide and various domains of the constant regions of the heavy or light chains of mammalian immunoglobulins. See EP 394,827; and Traunecker et al., Nature 331:84-86 (1988). The polypeptides of the present invention fused or conjugated to an antibody having disulfide-linked dimeric structures (due to the IgG) may also be more efficient in binding and neutralizing other molecules, than the monomeric secreted protein or protein fragment alone. See, for example, Fountoulakis et al., J. Biochem. 270:3958-3964 (1995). In many cases, the Fc part in a fusion protein is beneficial in therapy and diagnosis, and thus can result in, for example, improved pharmacokinetic properties. See, for example, EP A 232,262. Alternatively, deleting the Fc part after the fusion protein has been expressed, detected, and purified, would be desired. For example, the Fc portion may hinder therapy and diagnosis if the fusion protein is used as an antigen for immunizations. In drug discovery, for example, human proteins, such as hIL-5, have been fused with Fc portions for the purpose of high-throughput screening assays to identify antagonists of hIL-5. (See, Bennett et al., J. Molecular Recognition 8:52-58 (1995); Johanson et al., J. Biol. Chem. 270:9459-9471 (1995)).

Moreover, the antibodies or fragments thereof of the present invention can be fused to marker sequences, such as a peptide to facilitate purification. In preferred embodiments, the marker amino acid sequence is a hexa-histidine peptide, such as the tag provided in a pQE vector (QIAGEN, Inc., 9259 Eton Avenue, Chatsworth, CA, 91311), among others, many of which are commercially available. As described in Gentz et al., Proc. Natl. Acad. Sci. USA 86:821-824 (1989), for instance, hexa-histidine provides for convenient purification of the fusion protein. Other peptide tags useful for purification include, but are not limited to, the "HA" tag, which corresponds to an epitope derived from the influenza hemagglutinin protein (Wilson et al., Cell 37:767 (1984)) and the "flag" tag.

The present invention further encompasses antibodies or fragments thereof conjugated to a diagnostic or therapeutic agent. The antibodies can be used diagnostically to, for example, monitor the development or progression of a tumor as part of a clinical testing procedure to, e.g., determine the efficacy of a given treatment regimen. Detection can be facilitated by coupling the antibody to a detectable substance. Examples of detectable substances include various enzymes, prosthetic groups, fluorescent materials, luminescent materials, bioluminescent materials, radioactive materials, positron emitting metals using various positron emission tomographies, and nonradioactive paramagnetic metal ions. The detectable substance may be coupled or conjugated either directly to the antibody (or fragment thereof) or indirectly, through an intermediate (such as, for example, a linker known in the art) using techniques known in the art. See, for example, U.S.

Patent No. 4,741,900 for metal ions which can be conjugated to antibodies for use as diagnostics according to the present invention. Examples of suitable enzymes include horseradish peroxidase, alkaline phosphatase, beta-galactosidase, or acetylcholinesterase; examples of suitable prosthetic group complexes include streptavidin/biotin and avidin/biotin; examples of suitable fluorescent materials include umbelliferone, fluorescein, fluorescein isothiocyanate, rhodamine, dichlorotriazinylamine fluorescein, dansyl chloride or phycoerythrin; an example of a luminescent material includes luminol; examples of bioluminescent materials include luciferase, luciferin, and aequorin; and examples of suitable radioactive material include  $^{125}\text{I}$ ,  $^{131}\text{I}$ ,  $^{111}\text{In}$  or  $^{99}\text{Tc}$ .

Further, an antibody or fragment thereof may be conjugated to a therapeutic moiety such as a cytotoxin, e.g., a cytostatic or cytotoxic agent, a therapeutic agent or a radioactive metal ion, e.g., alpha-emitters such as, for example,  $^{213}\text{Bi}$ . A cytotoxin or cytotoxic agent includes any agent that is detrimental to cells. Examples include paclitaxol, cytochalasin B, gramicidin D, ethidium bromide, emetine, mitomycin, etoposide, teniposide, vincristine, vinblastine, colchicin, doxorubicin, daunorubicin, dihydroxy anthracin dione, mitoxantrone, mithramycin, actinomycin D, 1-dehydrotestosterone, glucocorticoids, procaine, tetracaine, lidocaine, propranolol, and puromycin and analogs or homologs thereof. Therapeutic agents include, but are not limited to, antimetabolites (e.g., methotrexate, 6-mercaptopurine, 6-thioguanine, cytarabine, 5-fluorouracil decarbazine), alkylating agents (e.g., mechlorethamine, thioepa chlorambucil, melphalan, carmustine (BSNU) and lomustine (CCNU), cyclophosphamide, busulfan, dibromomannitol, streptozotocin, mitomycin C, and cis- dichlorodiamine platinum (II) (DDP) cisplatin), anthracyclines (e.g., daunorubicin (formerly daunomycin) and doxorubicin), antibiotics (e.g., dactinomycin (formerly actinomycin), bleomycin, mithramycin, and anthramycin (AMC)), and anti-mitotic agents (e.g., vincristine and vinblastine).

The conjugates of the invention can be used for modifying a given biological response, the therapeutic agent or drug moiety is not to be construed as limited to classical chemical therapeutic agents. For example, the drug moiety may be a protein or polypeptide possessing a desired biological activity. Such proteins may include, for example, a toxin such as abrin, ricin A, pseudomonas exotoxin, or diphtheria toxin; a protein such as tumor necrosis factor,  $\alpha$ -interferon,  $\beta$ -interferon, nerve growth factor, platelet derived growth factor, tissue plasminogen activator, an apoptotic agent, e.g., TNF-alpha, TNF-beta, AIM I (See, International Publication No. WO 97/33899), AIM II (See, International Publication No. WO 97/34911), Fas Ligand (Takahashi *et al.*, *Int. Immunol.*, 6:1567-1574 (1994)), VEGI (See, International Publication No. WO 99/23105), a thrombotic agent or an anti- angiogenic agent, e.g., angiostatin or endostatin; or, biological response modifiers such as, for example, lymphokines, interleukin-1 ("IL-1"), interleukin-2 ("IL-2"), interleukin-6 ("IL-6"), granulocyte macrophage colony stimulating factor ("GM-CSF"), granulocyte colony stimulating factor ("G-CSF"), or other growth factors.

Antibodies may also be attached to solid supports, which are particularly useful for immunoassays or purification of the target antigen. Such solid supports include, but are not limited to, glass, cellulose, polyacrylamide, nylon, polystyrene, polyvinyl chloride or polypropylene.

- 5           Techniques for conjugating such therapeutic moiety to antibodies are well known. See, for example, Arnon et al., "Monoclonal Antibodies For Immunotargeting Of Drugs In Cancer Therapy", in *Monoclonal Antibodies And Cancer Therapy*, Reisfeld et al. (eds.), pp. 243-56 (Alan R. Liss, Inc. 1985); Hellstrom et al., "Antibodies For Drug Delivery", in *Controlled Drug Delivery* (2nd Ed.), Robinson et al. (eds.), pp. 623-53 (Marcel Dekker, Inc. 1987); Thorpe, 10 "Antibody Carriers Of Cytotoxic Agents In Cancer Therapy: A Review", in *Monoclonal Antibodies '84: Biological And Clinical Applications*, Pinchera et al. (eds.), pp. 475-506 (1985); "Analysis, Results, And Future Prospective Of The Therapeutic Use Of Radiolabeled Antibody In Cancer Therapy", in *Monoclonal Antibodies For Cancer Detection And Therapy*, Baldwin et al. (eds.), pp. 303-16 (Academic Press 1985), and Thorpe et al., "The Preparation And Cytotoxic 15 Properties Of Antibody-Toxin Conjugates", *Immunol. Rev.* 62:119-58 (1982).

Alternatively, an antibody can be conjugated to a second antibody to form an antibody heteroconjugate as described by Segal in U.S. Patent No. 4,676,980, which is incorporated herein by reference in its entirety.

- 20           An antibody, with or without a therapeutic moiety conjugated to it, administered alone or in combination with cytotoxic factor(s) and/or cytokine(s) can be used as a therapeutic.

#### *Immunophenotyping*

- 25           The antibodies of the invention may be utilized for immunophenotyping of cell lines and biological samples. Translation products of the gene of the present invention may be useful as cell-specific markers, or more specifically as cellular markers that are differentially expressed at various stages of differentiation and/or maturation of particular cell types. Monoclonal antibodies directed against a specific epitope, or combination of epitopes, will allow for the screening of cellular populations expressing the marker. Various techniques can be utilized using monoclonal antibodies to screen for cellular populations expressing the marker(s), and include magnetic 30 separation using antibody-coated magnetic beads, "panning" with antibody attached to a solid matrix (i.e., plate), and flow cytometry (See, e.g., U.S. Patent 5,985,660; and Morrison *et al.*, *Cell*, 96:737-49 (1999)).

- 35           These techniques allow for the screening of particular populations of cells, such as might be found with hematological malignancies (i.e. minimal residual disease (MRD) in acute leukemic patients) and "non-self" cells in transplantations to prevent Graft-versus-Host Disease (GVHD). Alternatively, these techniques allow for the screening of hematopoietic stem and



progenitor cells capable of undergoing proliferation and/or differentiation, as might be found in human umbilical cord blood.

#### *Assays For Antibody Binding*

5           The antibodies of the invention may be assayed for immunospecific binding by any method known in the art. The immunoassays which can be used include but are not limited to competitive and non-competitive assay systems using techniques such as western blots, radioimmunoassays, ELISA (enzyme linked immunosorbent assay), "sandwich" immunoassays, immunoprecipitation assays, precipitin reactions, gel diffusion precipitin reactions,  
10 immunodiffusion assays, agglutination assays, complement-fixation assays, immunoradiometric assays, fluorescent immunoassays, and protein A immunoassays, to name but a few. Such assays are routine and well known in the art (see, e.g., Ausubel et al, eds, 1994, Current Protocols in Molecular Biology, Vol. 1, John Wiley & Sons, Inc., New York, which is incorporated by reference herein in its entirety). Exemplary immunoassays are described briefly below (but are  
15 not intended by way of limitation).

Immunoprecipitation protocols generally comprise lysing a population of cells in a lysis buffer such as RIPA buffer (1% NP-40 or Triton X- 100, 1% sodium deoxycholate, 0.1% SDS, 0.15 M NaCl, 0.01 M sodium phosphate at pH 7.2, 1% Trasylol) supplemented with protein phosphatase and/or protease inhibitors (e.g., EDTA, PMSF, aprotinin, sodium vanadate), adding  
20 the antibody of interest to the cell lysate, incubating for a period of time (e.g., 1-4 hours) at 4° C, adding protein A and/or protein G sepharose beads to the cell lysate, incubating for about an hour or more at 4° C, washing the beads in lysis buffer and resuspending the beads in SDS/sample buffer. The ability of the antibody of interest to immunoprecipitate a particular antigen can be assessed by, e.g., western blot analysis. One of skill in the art would be knowledgeable as to the  
25 parameters that can be modified to increase the binding of the antibody to an antigen and decrease the background (e.g., pre-clearing the cell lysate with sepharose beads). For further discussion regarding immunoprecipitation protocols see, e.g., Ausubel et al., eds., (1994), Current Protocols in Molecular Biology, Vol. 1, John Wiley & Sons, Inc., New York, section 10.16.1.

Western blot analysis generally comprises preparing protein samples, electrophoresis  
30 of the protein samples in a polyacrylamide gel (e.g., 8%- 20% SDS-PAGE depending on the molecular weight of the antigen), transferring the protein sample from the polyacrylamide gel to a membrane such as nitrocellulose, PVDF or nylon, blocking the membrane in blocking solution (e.g., PBS with 3% BSA or non-fat milk), washing the membrane in washing buffer (e.g., PBS-Tween 20), blocking the membrane with primary antibody (the antibody of interest) diluted in  
35 blocking buffer, washing the membrane in washing buffer, blocking the membrane with a secondary antibody (which recognizes the primary antibody, e.g., an anti-human antibody)

conjugated to an enzymatic substrate (e.g., horseradish peroxidase or alkaline phosphatase) or radioactive molecule (e.g.,  $^{32}\text{P}$  or  $^{125}\text{I}$ ) diluted in blocking buffer, washing the membrane in wash buffer, and detecting the presence of the antigen. One of skill in the art would be knowledgeable as to the parameters that can be modified to increase the signal detected and to  
5 reduce the background noise. For further discussion regarding western blot protocols see, e.g., Ausubel et al, eds, (1994), Current Protocols in Molecular Biology, Vol. 1, John Wiley & Sons, Inc., New York, section 10.8.1.

ELISAs comprise preparing antigen, coating the well of a 96 well microtiter plate with the antigen, adding the antibody of interest conjugated to a detectable compound such as an  
10 enzymatic substrate (e.g., horseradish peroxidase or alkaline phosphatase) to the well and incubating for a period of time, and detecting the presence of the antigen. In ELISAs the antibody of interest does not have to be conjugated to a detectable compound; instead, a second antibody (which recognizes the antibody of interest) conjugated to a detectable compound may be added to the well. Further, instead of coating the well with the antigen, the antibody may be coated to the  
15 well. In this case, a second antibody conjugated to a detectable compound may be added following the addition of the antigen of interest to the coated well. One of skill in the art would be knowledgeable as to the parameters that can be modified to increase the signal detected as well as other variations of ELISAs known in the art. For further discussion regarding ELISAs see, e.g., Ausubel et al, eds, (1994), Current Protocols in Molecular Biology, Vol. 1, John Wiley & Sons,  
20 Inc., New York, section 11.2.1.

The binding affinity of an antibody to an antigen and the off-rate of an antibody-antigen interaction can be determined by competitive binding assays. One example of a competitive binding assay is a radioimmunoassay comprising the incubation of labeled antigen (e.g.,  $^3\text{H}$  or  $^{125}\text{I}$ ) with the antibody of interest in the presence of increasing amounts of unlabeled  
25 antigen, and the detection of the antibody bound to the labeled antigen. The affinity of the antibody of interest for a particular antigen and the binding off-rates can be determined from the data by scatchard plot analysis. Competition with a second antibody can also be determined using radioimmunoassays. In this case, the antigen is incubated with antibody of interest conjugated to a labeled compound (e.g.,  $^3\text{H}$  or  $^{125}\text{I}$ ) in the presence of increasing amounts of an unlabeled second  
30 antibody.

Antibodies of the invention may be characterized using immunocytochemistry methods on cells (e.g., mammalian cells, such as CHO cells) transfected with a vector enabling the expression of an antigen or with vector alone using techniques commonly known in the art. Antibodies that bind antigen transfected cells, but not vector-only transfected cells, are antigen  
35 specific.

***Therapeutic Uses***

Table 1D also provides information regarding biological activities and preferred therapeutic uses (i.e. see, "Preferred Indications" column) for polynucleotides and polypeptides of the invention (including antibodies, agonists, and/or antagonists thereof). Table 1D also provides information regarding assays which may be used to test polynucleotides and polypeptides of the invention (including antibodies, agonists, and/or antagonists thereof) for the corresponding biological activities. The first column ("Gene No.") provides the gene number in the application for each clone identifier. The second column ("cDNA ATCC Deposit No:Z") provides the unique clone identifier for each clone as previously described and indicated in Table 1A, Table 1B, and Table 1C. The third column ("AA SEQ ID NO:Y") indicates the Sequence Listing SEQ ID Number for polypeptide sequences encoded by the corresponding cDNA clones (also as indicated in Table 1A, Table 1B, and Table 2). The fourth column ("Biological Activity") indicates a biological activity corresponding to the indicated polypeptides (or polynucleotides encoding said polypeptides). The fifth column ("Exemplary Activity Assay") further describes the corresponding biological activity and also provides information pertaining to the various types of assays which may be performed to test, demonstrate, or quantify the corresponding biological activity.

The present invention is further directed to antibody-based therapies which involve administering antibodies of the invention to an animal, preferably a mammal, and most preferably a human, patient for treating one or more of the disclosed diseases, disorders, or conditions. Therapeutic compounds of the invention include, but are not limited to, antibodies of the invention (including fragments, analogs and derivatives thereof as described herein) and nucleic acids encoding antibodies of the invention (including fragments, analogs and derivatives thereof and anti-idiotypic antibodies as described herein). The antibodies of the invention can be used to detect, prevent, diagnose, prognosticate, treat, and/or ameliorate diseases, disorders or conditions associated with aberrant expression and/or activity of a polypeptide of the invention, including, but not limited to, immune diseases and disorders. The treatment and/or prevention of immune diseases and disorders associated with aberrant expression and/or activity of a polypeptide of the invention includes, but is not limited to, alleviating symptoms associated with immune diseases and disorders. Antibodies of the invention may be provided in pharmaceutically acceptable compositions as known in the art or as described herein.

In a specific and preferred embodiment, the present invention is directed to antibody-based therapies which involve administering antibodies of the invention to an animal, preferably a mammal, and most preferably a human, patient for treating immune diseases and disorders. Therapeutic compounds of the invention include, but are not limited to, antibodies of the invention (e.g., antibodies directed to the full length protein expressed on the cell surface of a mammalian

cell; antibodies directed to an epitope of a polypeptide of the invention (such as, for example, a predicted linear epitope shown in Table 1B; or a conformational epitope, including fragments, analogs and derivatives thereof as described herein) and nucleic acids encoding antibodies of the invention (including fragments, analogs and derivatives thereof and anti-idiotypic antibodies as described herein). The antibodies of the invention can be used to detect, diagnose, prevent, treat, prognosticate, and/or ameliorate immune diseases, disorders or conditions associated with aberrant expression and/or activity of a polypeptide of the invention. The treatment and/or prevention of immune diseases, disorders, or conditions associated with aberrant expression and/or activity of a polypeptide of the invention includes, but is not limited to, alleviating symptoms associated with those diseases, disorders or conditions. Antibodies of the invention may be provided in pharmaceutically acceptable compositions as known in the art or as described herein.

A summary of the ways in which the antibodies of the present invention may be used therapeutically includes binding polynucleotides or polypeptides of the present invention locally or systemically in the body or by direct cytotoxicity of the antibody, e.g. as mediated by complement (CDC) or by effector cells (ADCC). Some of these approaches are described in more detail below. Armed with the teachings provided herein, one of ordinary skill in the art will know how to use the antibodies of the present invention for diagnostic, monitoring or therapeutic purposes without undue experimentation.

The antibodies of this invention may be advantageously utilized in combination with other monoclonal or chimeric antibodies, or with lymphokines or hematopoietic growth factors (such as, e.g., IL-2, IL-3 and IL-7), for example, which serve to increase the number or activity of effector cells which interact with the antibodies.

The antibodies of the invention may be administered alone or in combination with other types of treatments (e.g., radiation therapy, chemotherapy, hormonal therapy, immunotherapy and anti-tumor agents). Generally, administration of products of a species origin or species reactivity (in the case of antibodies) that is the same species as that of the patient is preferred. Thus, in a preferred embodiment, human antibodies, fragments derivatives, analogs, or nucleic acids, are administered to a human patient for therapy or prophylaxis.

It is preferred to use high affinity and/or potent *in vivo* inhibiting and/or neutralizing antibodies against polypeptides or polynucleotides of the present invention, fragments or regions thereof, for both immunoassays directed to and therapy of immune diseases and disorders related to polynucleotides or polypeptides, including fragments thereof, of the present invention. Such antibodies, fragments, or regions, will preferably have an affinity for polynucleotides or polypeptides of the invention, including fragments thereof. Preferred binding affinities include those with a dissociation constant or  $K_d$  less than  $5 \times 10^{-2}$  M,  $10^{-2}$  M,  $5 \times 10^{-3}$  M,  $10^{-3}$  M,  $5 \times 10^{-4}$  M,  $10^{-4}$  M,  $5 \times 10^{-5}$  M,  $10^{-5}$  M,  $5 \times 10^{-6}$  M,  $10^{-6}$  M,  $5 \times 10^{-7}$  M,  $10^{-7}$  M,  $5 \times 10^{-8}$  M,  $10^{-8}$  M,  $5 \times$

$10^{-9}$  M,  $10^{-9}$  M,  $5 \times 10^{-10}$  M,  $10^{-10}$  M,  $5 \times 10^{-11}$  M,  $10^{-11}$  M,  $5 \times 10^{-12}$  M,  $10^{-12}$  M,  $5 \times 10^{-13}$  M,  $10^{-13}$  M,  $5 \times 10^{-14}$  M,  $10^{-14}$  M,  $5 \times 10^{-15}$  M, and  $10^{-15}$  M.

#### Gene Therapy

5 In a specific embodiment, nucleic acids comprising sequences encoding antibodies or functional derivatives thereof, are administered to treat, inhibit or prevent a immune disease or disorder associated with aberrant expression and/or activity of a polypeptide of the invention, by way of gene therapy. Gene therapy refers to therapy performed by the administration to a subject of an expressed or expressible nucleic acid. In this embodiment of the invention, the nucleic acids  
10 produce their encoded protein that mediates a therapeutic effect.

Any of the methods for gene therapy available in the art can be used according to the present invention. Exemplary methods are described below.

For general reviews of the methods of gene therapy, see Goldspiel et al., Clinical  
Pharmacy 12:488-505 (1993); Wu and Wu, Biotherapy 3:87-95 (1991); Tolstoshev, Ann. Rev.  
15 Pharmacol. Toxicol. 32:573-596 (1993); Mulligan, Science 260:926-932 (1993); and Morgan and Anderson, Ann. Rev. Biochem. 62:191-217 (1993); May, TIBTECH 11(5):155-215 (1993). Methods commonly known in the art of recombinant DNA technology which can be used are described in Ausubel et al. (eds.), Current Protocols in Molecular Biology, John Wiley & Sons, NY (1993); and Kriegler, Gene Transfer and Expression, A Laboratory Manual, Stockton Press,  
20 NY (1990).

In a preferred embodiment, the compound comprises nucleic acid sequences encoding an antibody, said nucleic acid sequences being part of expression vectors that express the antibody or fragments or chimeric proteins or heavy or light chains thereof in a suitable host. In particular, such nucleic acid sequences have promoters operably linked to the antibody coding region, said  
25 promoter being inducible or constitutive, and, optionally, tissue-specific. In another particular embodiment, nucleic acid molecules are used in which the antibody coding sequences and any other desired sequences are flanked by regions that promote homologous recombination at a desired site in the genome, thus providing for intrachromosomal expression of the antibody encoding nucleic acids (Koller and Smithies, Proc. Natl. Acad. Sci. USA 86:8932-8935 (1989);  
30 Zijlstra et al., Nature 342:435-438 (1989). In specific embodiments, the expressed antibody molecule is a single chain antibody; alternatively, the nucleic acid sequences include sequences encoding both the heavy and light chains, or fragments thereof, of the antibody.

Delivery of the nucleic acids into a patient may be either direct, in which case the patient is directly exposed to the nucleic acid or nucleic acid- carrying vectors, or indirect, in  
35 which case, cells are first transformed with the nucleic acids in vitro, then transplanted into the patient. These two approaches are known, respectively, as *in vivo* or *ex vivo* gene therapy.

In a specific embodiment, the nucleic acid sequences are directly administered *in vivo*, where it is expressed to produce the encoded product. This can be accomplished by any of numerous methods known in the art, e.g., by constructing them as part of an appropriate nucleic acid expression vector and administering it so that they become intracellular, e.g., by infection using defective or attenuated retrovirals or other viral vectors (see U.S. Patent No. 4,980,286), or by direct injection of naked DNA, or by use of microparticle bombardment (e.g., a gene gun; Biolistic, Dupont), or coating with lipids or cell-surface receptors or transfecting agents, encapsulation in liposomes, microparticles, or microcapsules, or by administering them in linkage to a peptide which is known to enter the nucleus, by administering it in linkage to a ligand subject to receptor-mediated endocytosis (see, e.g., Wu and Wu, J. Biol. Chem. 262:4429-4432 (1987)) (which can be used to target cell types specifically expressing the receptors), etc. In another embodiment, nucleic acid-ligand complexes can be formed in which the ligand comprises a fusogenic viral peptide to disrupt endosomes, allowing the nucleic acid to avoid lysosomal degradation. In yet another embodiment, the nucleic acid can be targeted *in vivo* for cell specific uptake and expression, by targeting a specific receptor (see, e.g., PCT Publications WO 92/06180; WO 92/22635; WO92/20316; WO93/14188, WO 93/20221). Alternatively, the nucleic acid can be introduced intracellularly and incorporated within host cell DNA for expression, by homologous recombination (Koller and Smithies, Proc. Natl. Acad. Sci. USA 86:8932-8935 (1989); Zijlstra et al., Nature 342:435-438 (1989)).

In a specific embodiment, viral vectors which contain nucleic acid sequences encoding an antibody of the invention are used. For example, a retroviral vector can be used (see Miller et al., Meth. Enzymol. 217:581-599 (1993)). These retroviral vectors contain the components necessary for the correct packaging of the viral genome and integration into the host cell DNA. The nucleic acid sequences encoding the antibody to be used in gene therapy are cloned into one or more vectors, which facilitates delivery of the gene into a patient. More detail about retroviral vectors can be found in Boesen et al., Biotherapy 6:291-302 (1994), which describes the use of a retroviral vector to deliver the *mdr1* gene to hematopoietic stem cells in order to make the stem cells more resistant to chemotherapy. Other references illustrating the use of retroviral vectors in gene therapy are: Clowes et al., J. Clin. Invest. 93:644-651 (1994); Kiem et al., Blood 83:1467-1473 (1994); Salmons and Gunzberg, Human Gene Therapy 4:129-141 (1993); and Grossman and Wilson, Curr. Opin. in Genetics and Devel. 3:110-114 (1993).

Adenoviruses are other viral vectors that can be used in gene therapy. Adenoviruses are especially attractive vehicles for delivering genes to respiratory epithelia. Adenoviruses naturally infect respiratory epithelia where they cause a mild disease. Other targets for adenovirus-based delivery systems are liver, the central nervous system, endothelial cells, and muscle. Adenoviruses have the advantage of being capable of infecting non-dividing cells.

Kozarsky and Wilson, *Current Opinion in Genetics and Development* 3:499-503 (1993) present a review of adenovirus-based gene therapy. Bout et al., *Human Gene Therapy* 5:3-10 (1994) demonstrated the use of adenovirus vectors to transfer genes to the respiratory epithelia of rhesus monkeys. Other instances of the use of adenoviruses in gene therapy can be found in Rosenfeld et al., *Science* 252:431-434 (1991); Rosenfeld et al., *Cell* 68:143-155 (1992); Mastrangeli et al., *J. Clin. Invest.* 91:225-234 (1993); PCT Publication WO94/12649; and Wang, et al., *Gene Therapy* 2:775-783 (1995). In a preferred embodiment, adenovirus vectors are used.

Adeno-associated virus (AAV) has also been proposed for use in gene therapy (Walsh et al., *Proc. Soc. Exp. Biol. Med.* 204:289-300 (1993); U.S. Patent No. 5,436,146).

Another approach to gene therapy involves transferring a gene to cells in tissue culture by such methods as electroporation, lipofection, calcium phosphate mediated transfection, or viral infection. Usually, the method of transfer includes the transfer of a selectable marker to the cells. The cells are then placed under selection to isolate those cells that have taken up and are expressing the transferred gene. Those cells are then delivered to a patient.

In this embodiment, the nucleic acid is introduced into a cell prior to administration *in vivo* of the resulting recombinant cell. Such introduction can be carried out by any method known in the art, including but not limited to transfection, electroporation, microinjection, infection with a viral or bacteriophage vector containing the nucleic acid sequences, cell fusion, chromosome-mediated gene transfer, microcell-mediated gene transfer, spheroplast fusion, etc. Numerous techniques are known in the art for the introduction of foreign genes into cells (see, e.g., Loeffler and Behr, *Meth. Enzymol.* 217:599-618 (1993); Cohen et al., *Meth. Enzymol.* 217:618-644 (1993); Cline, *Pharmac. Ther.* 29:69-92m (1985) and may be used in accordance with the present invention, provided that the necessary developmental and physiological functions of the recipient cells are not disrupted. The technique should provide for the stable transfer of the nucleic acid to the cell, so that the nucleic acid is expressible by the cell and preferably heritable and expressible by its cell progeny.

The resulting recombinant cells can be delivered to a patient by various methods known in the art. Recombinant blood cells (e.g., hematopoietic stem or progenitor cells) are preferably administered intravenously. The amount of cells envisioned for use depends on the desired effect, patient state, etc., and can be determined by one skilled in the art.

Cells into which a nucleic acid can be introduced for purposes of gene therapy encompass any desired, available cell type, and include but are not limited to epithelial cells, endothelial cells, keratinocytes, fibroblasts, muscle cells, hepatocytes; blood cells such as T lymphocytes, B lymphocytes, monocytes, macrophages, neutrophils, eosinophils, megakaryocytes, granulocytes; various stem or progenitor cells, in particular hematopoietic stem

or progenitor cells, e.g., as obtained from bone marrow, umbilical cord blood, peripheral blood, fetal liver, etc.

In a preferred embodiment, the cell used for gene therapy is autologous to the patient.

In an embodiment in which recombinant cells are used in gene therapy, nucleic acid  
5 sequences encoding an antibody are introduced into the cells such that they are expressible by the cells or their progeny, and the recombinant cells are then administered *in vivo* for therapeutic effect. In a specific embodiment, stem or progenitor cells are used. Any stem and/or progenitor cells which can be isolated and maintained *in vitro* can potentially be used in accordance with this embodiment of the present invention (see e.g. PCT Publication WO 94/08598; Stemple and  
10 Anderson, Cell 71:973-985 (1992); Rheinwald, Meth. Cell Bio. 21A:229 (1980); and Pittelkow and Scott, Mayo Clinic Proc. 61:771 (1986)).

In a specific embodiment, the nucleic acid to be introduced for purposes of gene therapy comprises an inducible promoter operably linked to the coding region, such that  
15 expression of the nucleic acid is controllable by the presence or absence of an appropriate inducer of transcription.

#### *Demonstration of Therapeutic or Prophylactic Activity*

The compounds or pharmaceutical compositions of the invention are preferably tested  
in vitro, and then *in vivo* for the desired therapeutic or prophylactic activity, prior to use in  
20 humans. For example, *in vitro* assays to demonstrate the therapeutic or prophylactic utility of a compound or pharmaceutical composition include, the effect of a compound on a cell line or a patient tissue sample. The effect of the compound or composition on the cell line and/or tissue sample can be determined utilizing techniques known to those of skill in the art including, but not limited to, rosette formation assays and cell lysis assays. In accordance with the invention, *in vitro*  
25 assays which can be used to determine whether administration of a specific compound is indicated, include *in vitro* cell culture assays in which a patient tissue sample is grown in culture, and exposed to or otherwise administered a compound, and the effect of such compound upon the tissue sample is observed.

#### 30 *Therapeutic/Prophylactic Administration and Composition*

The invention provides methods of treatment, inhibition and prophylaxis by administration to a subject of an effective amount of a compound or pharmaceutical composition of the invention, preferably a polypeptide or antibody of the invention. In a preferred embodiment, the compound is substantially purified (e.g., substantially free from substances that  
35 limit its effect or produce undesired side-effects). The subject is preferably an animal, including



but not limited to animals such as cows, pigs, horses, chickens, cats, dogs, etc., and is preferably a mammal, and most preferably human.

Formulations and methods of administration that can be employed when the compound comprises a nucleic acid or an immunoglobulin are described above; additional  
5 appropriate formulations and routes of administration can be selected from among those described herein below.

Various delivery systems are known and can be used to administer a compound of the invention, e.g., encapsulation in liposomes, microparticles, microcapsules, recombinant cells capable of expressing the compound, receptor-mediated endocytosis (see, e.g., Wu and Wu, J.  
10 Biol. Chem. 262:4429-4432 (1987)), construction of a nucleic acid as part of a retroviral or other vector, etc. Methods of introduction include but are not limited to intradermal, intramuscular, intraperitoneal, intravenous, subcutaneous, intranasal, epidural, and oral routes. The compounds or compositions may be administered by any convenient route, for example by infusion or bolus injection, by absorption through epithelial or mucocutaneous linings (e.g., oral mucosa, rectal and  
15 intestinal mucosa, etc.) and may be administered together with other biologically active agents. Administration can be systemic or local. In addition, it may be desirable to introduce the pharmaceutical compounds or compositions of the invention into the central nervous system by any suitable route, including intraventricular and intrathecal injection; intraventricular injection may be facilitated by an intraventricular catheter, for example, attached to a reservoir, such as an  
20 Ommaya reservoir. Pulmonary administration can also be employed, e.g., by use of an inhaler or nebulizer, and formulation with an aerosolizing agent.

In a specific embodiment, it may be desirable to administer the pharmaceutical compounds or compositions of the invention locally to the area in need of treatment; this may be achieved by, for example, and not by way of limitation, local infusion during surgery, topical  
25 application, e.g., in conjunction with a wound dressing after surgery, by injection, by means of a catheter, by means of a suppository, or by means of an implant, said implant being of a porous, non-porous, or gelatinous material, including membranes, such as sialastic membranes, or fibers. Preferably, when administering a protein, including an antibody, of the invention, care must be taken to use materials to which the protein does not absorb.

30 In another embodiment, the compound or composition can be delivered in a vesicle, in particular a liposome (see Langer, Science 249:1527-1533 (1990); Treat et al., in Liposomes in the Therapy of Infectious Disease and Cancer, Lopez-Berestein and Fidler (eds.), Liss, New York, pp. 353- 365 (1989); Lopez-Berestein, *ibid.*, pp. 317-327; see generally *ibid.*)

In yet another embodiment, the compound or composition can be delivered in a  
35 controlled release system. In one embodiment, a pump may be used (see Langer, *supra*; Sefton, CRC Crit. Ref. Biomed. Eng. 14:201 (1987); Buchwald et al., Surgery 88:507 (1980); Saudek et

al., N. Engl. J. Med. 321:574 (1989)). In another embodiment, polymeric materials can be used (see Medical Applications of Controlled Release, Langer and Wise (eds.), CRC Pres., Boca Raton, Florida (1974); Controlled Drug Bioavailability, Drug Product Design and Performance, Smolen and Ball (eds.), Wiley, New York (1984); Ranger and Peppas, J., Macromol. Sci. Rev. Macromol. Chem. 23:61 (1983); see also Levy et al., Science 228:190 (1985); During et al., Ann. Neurol. 25:351 (1989); Howard et al., J.Neurosurg. 71:105 (1989)). In yet another embodiment, a controlled release system can be placed in proximity of the therapeutic target, e.g., the brain, thus requiring only a fraction of the systemic dose (see, e.g., Goodson, in Medical Applications of Controlled Release, *supra*, vol. 2, pp. 115-138 (1984)).

10           Other controlled release systems are discussed in the review by Langer (Science 249:1527-1533 (1990)).

          In a specific embodiment where the compound of the invention is a nucleic acid encoding a protein, the nucleic acid can be administered *in vivo* to promote expression of its encoded protein, by constructing it as part of an appropriate nucleic acid expression vector and administering it so that it becomes intracellular, e.g., by use of a retroviral vector (see U.S. Patent 15       No. 4,980,286), or by direct injection, or by use of microparticle bombardment (e.g., a gene gun; Biolistic, Dupont), or coating with lipids or cell-surface receptors or transfecting agents, or by administering it in linkage to a homeobox- like peptide which is known to enter the nucleus (see e.g., Joliot et al., Proc. Natl. Acad. Sci. USA 88:1864-1868 (1991)), etc. Alternatively, a nucleic 20       acid can be introduced intracellularly and incorporated within host cell DNA for expression, by homologous recombination.

          The present invention also provides pharmaceutical compositions. Such compositions comprise a therapeutically effective amount of a compound, and a pharmaceutically acceptable carrier. In a specific embodiment, the term "pharmaceutically acceptable" means approved by a 25       regulatory agency of the Federal or a state government or listed in the U.S. Pharmacopeia or other generally recognized pharmacopeia for use in animals, and more particularly in humans. The term "carrier" refers to a diluent, adjuvant, excipient, or vehicle with which the therapeutic is administered. Such pharmaceutical carriers can be sterile liquids, such as water and oils, including those of petroleum, animal, vegetable or synthetic origin, such as peanut oil, soybean oil, mineral 30       oil, sesame oil and the like. Water is a preferred carrier when the pharmaceutical composition is administered intravenously. Saline solutions and aqueous dextrose and glycerol solutions can also be employed as liquid carriers, particularly for injectable solutions. Suitable pharmaceutical excipients include starch, glucose, lactose, sucrose, gelatin, malt, rice, flour, chalk, silica gel, sodium stearate, glycerol monostearate, talc, sodium chloride, dried skim milk, glycerol, 35       propylene, glycol, water, ethanol and the like. The composition, if desired, can also contain minor amounts of wetting or emulsifying agents, or pH buffering agents. These compositions can take

the form of solutions, suspensions, emulsion, tablets, pills, capsules, powders, sustained-release formulations and the like. The composition can be formulated as a suppository, with traditional binders and carriers such as triglycerides. Oral formulation can include standard carriers such as pharmaceutical grades of mannitol, lactose, starch, magnesium stearate, sodium saccharine, cellulose, magnesium carbonate, etc. Examples of suitable pharmaceutical carriers are described in "Remington's Pharmaceutical Sciences" by E.W. Martin. Such compositions will contain a therapeutically effective amount of the compound, preferably in purified form, together with a suitable amount of carrier so as to provide the form for proper administration to the patient. The formulation should suit the mode of administration.

10 In a preferred embodiment, the composition is formulated in accordance with routine procedures as a pharmaceutical composition adapted for intravenous administration to human beings. Typically, compositions for intravenous administration are solutions in sterile isotonic aqueous buffer. Where necessary, the composition may also include a solubilizing agent and a local anesthetic such as lignocaine to ease pain at the site of the injection. Generally, the  
15 ingredients are supplied either separately or mixed together in unit dosage form, for example, as a dry lyophilized powder or water free concentrate in a hermetically sealed container such as an ampoule or sachette indicating the quantity of active agent. Where the composition is to be administered by infusion, it can be dispensed with an infusion bottle containing sterile pharmaceutical grade water or saline. Where the composition is administered by injection, an  
20 ampoule of sterile water for injection or saline can be provided so that the ingredients may be mixed prior to administration.

The compounds of the invention can be formulated as neutral or salt forms. Pharmaceutically acceptable salts include those formed with anions such as those derived from hydrochloric, phosphoric, acetic, oxalic, tartaric acids, etc., and those formed with cations such as those derived from sodium, potassium, ammonium, calcium, ferric hydroxides, isopropylamine, triethylamine, 2-ethylamino ethanol, histidine, procaine, etc.

The amount of the compound of the invention which will be effective in the treatment, inhibition and prevention of a disease or disorder associated with aberrant expression and/or activity of a polypeptide of the invention can be determined by standard clinical techniques. In  
30 addition, *in vitro* assays may optionally be employed to help identify optimal dosage ranges. The precise dose to be employed in the formulation will also depend on the route of administration, and the seriousness of the disease or disorder, and should be decided according to the judgment of the practitioner and each patient's circumstances. Effective doses may be extrapolated from dose-response curves derived from *in vitro* or animal model test systems.

35 For antibodies, the dosage administered to a patient is typically 0.1 mg/kg to 100 mg/kg of the patient's body weight. Preferably, the dosage administered to a patient is between

0.1 mg/kg and 20 mg/kg of the patient's body weight, more preferably 1 mg/kg to 10 mg/kg of the patient's body weight. Generally, human antibodies have a longer half-life within the human body than antibodies from other species due to the immune response to the foreign polypeptides. Thus, lower dosages of human antibodies and less frequent administration is often possible. Further, the dosage and frequency of administration of antibodies of the invention may be reduced by enhancing uptake and tissue penetration (e.g., into the brain) of the antibodies by modifications such as, for example, lipidation.

The invention also provides a pharmaceutical pack or kit comprising one or more containers filled with one or more of the ingredients of the pharmaceutical compositions of the invention. Optionally associated with such container(s) can be a notice in the form prescribed by a governmental agency regulating the manufacture, use or sale of pharmaceuticals or biological products, which notice reflects approval by the agency of manufacture, use or sale for human administration.

#### 15 *Diagnosis and Imaging*

Labeled antibodies, and derivatives and analogs thereof, which specifically bind to a polypeptide of interest can be used for diagnostic purposes to detect, diagnose, prognosticate, or monitor immune diseases, disorders, and/or conditions associated with the aberrant expression and/or activity of a polypeptide of the invention. The invention provides for the detection of aberrant expression of a polypeptide of interest, comprising (a) assaying the expression of the polypeptide of interest in cells or body fluid of an individual using one or more antibodies specific to the polypeptide interest and (b) comparing the level of gene expression with a standard gene expression level, whereby an increase or decrease in the assayed polypeptide gene expression level compared to the standard expression level is indicative of aberrant expression.

The invention provides a diagnostic assay for diagnosing an immune disease or disorder, comprising (a) assaying the expression of the polypeptide of interest in cells or body fluid of an individual using one or more antibodies specific to the polypeptide interest and (b) comparing the level of gene expression with a standard gene expression level, whereby an increase or decrease in the assayed polypeptide gene expression level compared to the standard expression level is indicative of a particular immune disease or disorder. With respect to immunogenic cancers, the presence of a relatively high amount of transcript in biopsied tissue from an individual may indicate a predisposition for the development of the disease, or may provide a means for detecting the disease prior to the appearance of actual clinical symptoms. A more definitive diagnosis of this type may allow health professionals to employ preventative measures or aggressive treatment earlier thereby preventing the development or further progression of the immunogenic cancer.

Antibodies of the invention can be used to assay protein levels in a biological sample using classical immunohistological methods known to those of skill in the art (e.g., see Jalkanen et al., J. Cell. Biol. 101:976-985 (1985); Jalkanen et al., J. Cell. Biol. 105:3087-3096 (1987)). Other antibody-based methods useful for detecting protein gene expression include immunoassays, such as the enzyme linked immunosorbent assay (ELISA) and the radioimmunoassay (RIA). Suitable antibody assay labels are known in the art and include enzyme labels, such as, glucose oxidase; radioisotopes, such as iodine (125I, 121I), carbon (14C), sulfur (35S), tritium (3H), indium (112In), and technetium (99Tc); luminescent labels, such as luminol; and fluorescent labels, such as fluorescein and rhodamine, and biotin.

One facet of the invention is the detection and diagnosis of a disease or disorder associated with aberrant expression of a polypeptide of interest in an animal, preferably a mammal and most preferably a human. In one embodiment, diagnosis comprises: a) administering (for example, parenterally, subcutaneously, or intraperitoneally) to a subject an effective amount of a labeled molecule which specifically binds to the polypeptide of interest; b) waiting for a time interval following the administering for permitting the labeled molecule to preferentially concentrate at sites in the subject where the polypeptide is expressed (and for unbound labeled molecule to be cleared to background level); c) determining background level; and d) detecting the labeled molecule in the subject, such that detection of labeled molecule above the background level indicates that the subject has a particular disease or disorder associated with aberrant expression of the polypeptide of interest. Background level can be determined by various methods including, comparing the amount of labeled molecule detected to a standard value previously determined for a particular system.

It will be understood in the art that the size of the subject and the imaging system used will determine the quantity of imaging moiety needed to produce diagnostic images. In the case of a radioisotope moiety, for a human subject, the quantity of radioactivity injected will normally range from about 5 to 20 millicuries of 99mTc. The labeled antibody or antibody fragment will then preferentially accumulate at the location of cells which contain the specific protein. *In vivo* tumor imaging is described in S.W. Burchiel et al., "Immunopharmacokinetics of Radiolabeled Antibodies and Their Fragments." (Chapter 13 in Tumor Imaging: The Radiochemical Detection of Cancer, S.W. Burchiel and B. A. Rhodes, eds., Masson Publishing Inc. (1982)).

Depending on several variables, including the type of label used and the mode of administration, the time interval following the administration for permitting the labeled molecule to preferentially concentrate at sites in the subject and for unbound labeled molecule to be cleared to background level is 6 to 48 hours or 6 to 24 hours or 6 to 12 hours. In another embodiment the time interval following administration is 5 to 20 days or 5 to 10 days.

In an embodiment, monitoring of the disease or disorder is carried out by repeating the method for diagnosing the disease or disease, for example, one month after initial diagnosis, six months after initial diagnosis, one year after initial diagnosis, etc.

5 Presence of the labeled molecule can be detected in the patient using methods known in the art for *in vivo* scanning. These methods depend upon the type of label used. Skilled artisans will be able to determine the appropriate method for detecting a particular label. Methods and devices that may be used in the diagnostic methods of the invention include, but are not limited to, computed tomography (CT), whole body scan such as position emission tomography (PET), magnetic resonance imaging (MRI), and sonography.

10 In a specific embodiment, the molecule is labeled with a radioisotope and is detected in the patient using a radiation responsive surgical instrument (Thurston et al., U.S. Patent No. 5,441,050). In another embodiment, the molecule is labeled with a fluorescent compound and is detected in the patient using a fluorescence responsive scanning instrument. In another embodiment, the molecule is labeled with a positron emitting metal and is detected in the patent  
15 using positron emission-tomography. In yet another embodiment, the molecule is labeled with a paramagnetic label and is detected in a patient using magnetic resonance imaging (MRI).

#### Kits

The present invention provides kits that can be used in the above methods. In one  
20 embodiment, a kit comprises an antibody of the invention, preferably a purified antibody, in one or more containers. In a specific embodiment, the kits of the present invention contain a substantially isolated polypeptide comprising an epitope that is specifically immunoreactive with an antibody included in the kit. Preferably, the kits of the present invention further comprise a control antibody that does not react with the polypeptide of interest. In another specific embodiment, the  
25 kits of the present invention contain a means for detecting the binding of an antibody to a polypeptide of interest (e.g., the antibody may be conjugated to a detectable substrate such as a fluorescent compound, an enzymatic substrate, a radioactive compound or a luminescent compound, or a second antibody which recognizes the first antibody may be conjugated to a detectable substrate).

30 In another specific embodiment of the present invention, the kit is a diagnostic kit for use in screening serum containing antibodies specific against proliferative and/or cancerous polynucleotides and polypeptides. Such a kit may include a control antibody that does not react with the polypeptide of interest. Such a kit may include a substantially isolated polypeptide antigen comprising an epitope that is specifically immunoreactive with at least one anti-  
35 polypeptide antigen antibody. Further, such a kit includes means for detecting the binding of said antibody to the antigen (e.g., the antibody may be conjugated to a fluorescent compound such as

fluorescein or rhodamine which can be detected by flow cytometry). In specific embodiments, the kit may include a recombinantly produced or chemically synthesized polypeptide antigen. The polypeptide antigen of the kit may also be attached to a solid support.

5 In a more specific embodiment the detecting means of the above-described kit includes a solid support to which said polypeptide antigen is attached. Such a kit may also include a non-attached reporter-labeled anti-human antibody. In this embodiment, binding of the antibody to the polypeptide antigen can be detected by binding of the said reporter-labeled antibody.

10 In an additional embodiment, the invention includes a diagnostic kit for use in screening serum containing antigens of the polypeptide of the invention. The diagnostic kit includes a substantially isolated antibody specifically immunoreactive with polypeptide or polynucleotide antigens, and means for detecting the binding of the polynucleotide or polypeptide antigen to the antibody. In one embodiment, the antibody is attached to a solid support. In a specific embodiment, the antibody may be a monoclonal antibody. The detecting means of the kit may include a second, labeled monoclonal antibody. Alternatively, or in addition, the detecting  
15 means may include a labeled, competing antigen.

In one diagnostic configuration, test serum is reacted with a solid phase reagent having a surface-bound antigen obtained by the methods of the present invention. After binding with specific antigen antibody to the reagent and removing unbound serum components by washing, the reagent is reacted with reporter-labeled anti-human antibody to bind reporter to the  
20 reagent in proportion to the amount of bound anti-antigen antibody on the solid support. The reagent is again washed to remove unbound labeled antibody, and the amount of reporter associated with the reagent is determined. Typically, the reporter is an enzyme which is detected by incubating the solid phase in the presence of a suitable fluorometric, luminescent or colorimetric substrate (Sigma, St. Louis, MO).

25 The solid surface reagent in the above assay is prepared by known techniques for attaching protein material to solid support material, such as polymeric beads, dip sticks, 96-well plate or filter material. These attachment methods generally include non-specific adsorption of the protein to the support or covalent attachment of the protein, typically through a free amine group, to a chemically reactive group on the solid support, such as an activated carboxyl, hydroxyl, or  
30 aldehyde group. Alternatively, streptavidin coated plates can be used in conjunction with biotinylated antigen(s).

Thus, the invention provides an assay system or kit for carrying out this diagnostic method. The kit generally includes a support with surface-bound recombinant antigens, and a reporter-labeled anti-human antibody for detecting surface-bound anti-antigen antibody.

35

#### Uses of the Polynucleotides

Each of the polynucleotides identified herein can be used in numerous ways as reagents. The following description should be considered exemplary and utilizes known techniques.

The polynucleotides of the present invention are useful for chromosome identification.

- 5 There exists an ongoing need to identify new chromosome markers, since few chromosome marking reagents, based on actual sequence data (repeat polymorphisms), are presently available. Each sequence is specifically targeted to and can hybridize with a particular location on an individual human chromosome, thus each polynucleotide of the present invention can routinely be used as a chromosome marker using techniques known in the art. Table 1B.1, column 8 provides  
10 the chromosome location of some of the polynucleotides of the invention.

- Briefly, sequences can be mapped to chromosomes by preparing PCR primers (preferably at least 15 bp (e.g., 15-25 bp) from the sequences shown in SEQ ID NO:X. Primers can optionally be selected using computer analysis so that primers do not span more than one predicted exon in the genomic DNA. These primers are then used for PCR screening of somatic  
15 cell hybrids containing individual human chromosomes. Only those hybrids containing the human gene corresponding to SEQ ID NO:X will yield an amplified fragment.

- Similarly, somatic hybrids provide a rapid method of PCR mapping the polynucleotides to particular chromosomes. Three or more clones can be assigned per day using a single thermal cycler. Moreover, sublocalization of the polynucleotides can be achieved with  
20 panels of specific chromosome fragments. Other gene mapping strategies that can be used include in situ hybridization, prescreening with labeled flow-sorted chromosomes, preselection by hybridization to construct chromosome specific-cDNA libraries, and computer mapping techniques (See, e.g., Shuler, Trends Biotechnol 16:456-459 (1998) which is hereby incorporated by reference in its entirety).

- 25 Precise chromosomal location of the polynucleotides can also be achieved using fluorescence in situ hybridization (FISH) of a metaphase chromosomal spread. This technique uses polynucleotides as short as 500 or 600 bases; however, polynucleotides 2,000-4,000 bp are preferred. For a review of this technique, see Verma et al., "Human Chromosomes: a Manual of Basic Techniques," Pergamon Press, New York (1988).

- 30 For chromosome mapping, the polynucleotides can be used individually (to mark a single chromosome or a single site on that chromosome) or in panels (for marking multiple sites and/or multiple chromosomes).

- Thus, the present invention also provides a method for chromosomal localization which involves (a) preparing PCR primers from the polynucleotide sequences in Table 1B and/or  
35 Table 2 and SEQ ID NO:X and (b) screening somatic cell hybrids containing individual chromosomes.



The polynucleotides of the present invention would likewise be useful for radiation hybrid mapping, HAPPY mapping, and long range restriction mapping. For a review of these techniques and others known in the art, see, e.g. Dear, "Genome Mapping: A Practical Approach," IRL Press at Oxford University Press, London (1997); Aydin, J. Mol. Med. 77:691-694 (1999); Hacia et al., Mol. Psychiatry 3:483-492 (1998); Herrick et al., Chromosome Res. 7:409-423 (1999); Hamilton et al., Methods Cell Biol. 62:265-280 (2000); and/or Ott, J. Hered. 90:68-70 (1999) each of which is hereby incorporated by reference in its entirety.

Once a polynucleotide has been mapped to a precise chromosomal location, the physical position of the polynucleotide can be used in linkage analysis. Linkage analysis establishes coinheritance between a chromosomal location and presentation of a particular disease. (Disease mapping data are found, for example, in V. McKusick, Mendelian Inheritance in Man (available on line through Johns Hopkins University Welch Medical Library)). Column 9 of Table 1B.1 provides an OMIM reference identification number of diseases associated with the cytologic band disclosed in column 8 of Table 1B.1, as determined using techniques described herein and by reference to Table 5. Assuming 1 megabase mapping resolution and one gene per 20 kb, a cDNA precisely localized to a chromosomal region associated with the disease could be one of 50-500 potential causative genes.

Thus, once coinheritance is established, differences in a polynucleotide of the invention and the corresponding gene between affected and unaffected individuals can be examined. First, visible structural alterations in the chromosomes, such as deletions or translocations, are examined in chromosome spreads or by PCR. If no structural alterations exist, the presence of point mutations are ascertained. Mutations observed in some or all affected individuals, but not in normal individuals, indicates that the mutation may cause the disease. However, complete sequencing of the polypeptide and the corresponding gene from several normal individuals is required to distinguish the mutation from a polymorphism. If a new polymorphism is identified, this polymorphic polypeptide can be used for further linkage analysis.

Furthermore, increased or decreased expression of the gene in affected individuals as compared to unaffected individuals can be assessed using the polynucleotides of the invention. Any of these alterations (altered expression, chromosomal rearrangement, or mutation) can be used as a diagnostic or prognostic marker. Diagnostic and prognostic methods, kits and reagents encompassed by the present invention are briefly described below and more thoroughly elsewhere herein (see e.g., the sections labeled "Antibodies", "Diagnostic Assays", and "Methods for Detecting Diseases").

Thus, the invention also provides a diagnostic method useful during diagnosis of a disorder, involving measuring the expression level of polynucleotides of the present invention in cells or body fluid from an individual and comparing the measured gene expression level with a

standard level of polynucleotide expression level, whereby an increase or decrease in the gene expression level compared to the standard is indicative of a disorder. Additional non-limiting examples of diagnostic methods encompassed by the present invention are more thoroughly described elsewhere herein (see, e.g., Example 12).

5 In still another embodiment, the invention includes a kit for analyzing samples for the presence of proliferative and/or cancerous polynucleotides derived from a test subject. In a general embodiment, the kit includes at least one polynucleotide probe containing a nucleotide sequence that will specifically hybridize with a polynucleotide of the invention and a suitable container. In a specific embodiment, the kit includes two polynucleotide probes defining an internal region of the  
10 polynucleotide of the invention, where each probe has one strand containing a 31' mer-end internal to the region. In a further embodiment, the probes may be useful as primers for polymerase chain reaction amplification.

Where a diagnosis of a related disorder, including, for example, diagnosis of a tumor, has already been made according to conventional methods, the present invention is useful as a  
15 prognostic indicator, whereby patients exhibiting enhanced or depressed polynucleotide of the invention expression will experience a worse clinical outcome relative to patients expressing the gene at a level nearer the standard level.

By "measuring the expression level of polynucleotides of the invention" is intended qualitatively or quantitatively measuring or estimating the level of the polypeptide of the invention or the level of the mRNA encoding the polypeptide of the invention in a first biological sample  
20 either directly (e.g., by determining or estimating absolute protein level or mRNA level) or relatively (e.g., by comparing to the polypeptide level or mRNA level in a second biological sample). Preferably, the polypeptide level or mRNA level in the first biological sample is measured or estimated and compared to a standard polypeptide level or mRNA level, the standard  
25 being taken from a second biological sample obtained from an individual not having the related disorder or being determined by averaging levels from a population of individuals not having a related disorder. As will be appreciated in the art, once a standard polypeptide level or mRNA level is known, it can be used repeatedly as a standard for comparison.

By "biological sample" is intended any biological sample obtained from an individual,  
30 body fluid, cell line, tissue culture, or other source that contains polypeptide of the present invention or the corresponding mRNA. As indicated, biological samples include body fluids (such as semen, lymph, vaginal pool, sera, plasma, urine, synovial fluid and spinal fluid) which contain the polypeptide of the present invention, and tissue sources found to express the polypeptide of the present invention. Methods for obtaining tissue biopsies and body fluids from mammals are well  
35 known in the art. Where the biological sample is to include mRNA, a tissue biopsy is the preferred source.

The method(s) provided above may preferably be applied in a diagnostic method and/or kits in which polynucleotides and/or polypeptides of the invention are attached to a solid support. In one exemplary method, the support may be a "gene chip" or a "biological chip" as described in US Patents 5,837,832, 5,874,219, and 5,856,174. Further, such a gene chip with polynucleotides of the invention attached may be used to identify polymorphisms between the isolated polynucleotide sequences of the invention, with polynucleotides isolated from a test subject. The knowledge of such polymorphisms (i.e. their location, as well as, their existence) would be beneficial in identifying disease loci for many disorders, such as for example, in neural disorders, immune system disorders, muscular disorders, reproductive disorders, gastrointestinal disorders, pulmonary disorders, digestive disorders, metabolic disorders, cardiovascular disorders, renal disorders, proliferative disorders, and/or cancerous diseases and conditions. Such a method is described in US Patents 5,858,659 and 5,856,104. The US Patents referenced *supra* are hereby incorporated by reference in their entirety herein.

The present invention encompasses polynucleotides of the present invention that are chemically synthesized, or reproduced as peptide nucleic acids (PNA), or according to other methods known in the art. The use of PNAs would serve as the preferred form if the polynucleotides of the invention are incorporated onto a solid support, or gene chip. For the purposes of the present invention, a peptide nucleic acid (PNA) is a polyamide type of DNA analog and the monomeric units for adenine, guanine, thymine and cytosine are available commercially (Perceptive Biosystems). Certain components of DNA, such as phosphorus, phosphorus oxides, or deoxyribose derivatives, are not present in PNAs. As disclosed by Nielsen et al., Science 254, 1497 (1991); and Egholm et al., Nature 365, 666 (1993), PNAs bind specifically and tightly to complementary DNA strands and are not degraded by nucleases. In fact, PNA binds more strongly to DNA than DNA itself does. This is probably because there is no electrostatic repulsion between the two strands, and also the polyamide backbone is more flexible. Because of this, PNA/DNA duplexes bind under a wider range of stringency conditions than DNA/DNA duplexes, making it easier to perform multiplex hybridization. Smaller probes can be used than with DNA due to the strong binding. In addition, it is more likely that single base mismatches can be determined with PNA/DNA hybridization because a single mismatch in a PNA/DNA 15-mer lowers the melting point ( $T_{sub.m}$ ) by 8°-20° C, vs. 4°-16° C for the DNA/DNA 15-mer duplex. Also, the absence of charge groups in PNA means that hybridization can be done at low ionic strengths and reduce possible interference by salt during the analysis.

The compounds of the present invention have uses which include, but are not limited to, detecting cancer in mammals. In particular the invention is useful during diagnosis of pathological cell proliferative neoplasias which include, but are not limited to: acute myelogenous leukemias including acute monocytic leukemia, acute myeloblastic leukemia, acute promyelocytic

leukemia, acute myelomonocytic leukemia, acute erythroleukemia, acute megakaryocytic leukemia, and acute undifferentiated leukemia, etc.; and chronic myelogenous leukemias including chronic myelomonocytic leukemia, chronic granulocytic leukemia, etc. Preferred mammals include monkeys, apes, cats, dogs, cows, pigs, horses, rabbits and humans. Particularly preferred

5 are humans.

Pathological cell proliferative disorders are often associated with inappropriate activation of proto-oncogenes. (Germann, E. P. et al., "The Etiology of Acute Leukemia: Molecular Genetics and Viral Oncology," in *Neoplastic Diseases of the Blood*, Vol 1., Wiernik, P. H. et al. eds., 161-182 (1985)). Neoplasias are now believed to result from the qualitative

10 alteration of a normal cellular gene product, or from the quantitative modification of gene expression by insertion into the chromosome of a viral sequence, by chromosomal translocation of a gene to a more actively transcribed region, or by some other mechanism. (Germann et al., *supra*) It is likely that mutated or altered expression of specific genes is involved in the pathogenesis of some leukemias, among other tissues and cell types. (Germann et al., *supra*) Indeed, the human

15 counterparts of the oncogenes involved in some animal neoplasias have been amplified or translocated in some cases of human leukemia and carcinoma. (Germann et al., *supra*)

For example, c-myc expression is highly amplified in the non-lymphocytic leukemia cell line HL-60. When HL-60 cells are chemically induced to stop proliferation, the level of c-myc is found to be downregulated. (International Publication Number WO 91/15580). However, it

20 has been shown that exposure of HL-60 cells to a DNA construct that is complementary to the 5' end of c-myc or c-myb blocks translation of the corresponding mRNAs which downregulates expression of the c-myc or c-myb proteins and causes arrest of cell proliferation and differentiation of the treated cells. (International Publication Number WO 91/15580; Wickstrom et al., *Proc. Natl. Acad. Sci.* 85:1028 (1988); Anfossi et al., *Proc. Natl. Acad. Sci.* 86:3379 (1989)). However,

25 the skilled artisan would appreciate the present invention's usefulness is not be limited to treatment, prevention, and/or prognosis of proliferative disorders of cells and tissues of hematopoietic origin, in light of the numerous cells and cell types of varying origins which are known to exhibit proliferative phenotypes.

In addition to the foregoing, a polynucleotide of the present invention can be used to

30 control gene expression through triple helix formation or through antisense DNA or RNA. Antisense techniques are discussed, for example, in Okano, J. *Neurochem.* 56: 560 (1991); "Oligodeoxynucleotides as Antisense Inhibitors of Gene Expression, CRC Press, Boca Raton, FL (1988). Triple helix formation is discussed in, for instance Lee et al., *Nucleic Acids Research* 6: 3073 (1979); Cooney et al., *Science* 241: 456 (1988); and Dervan et al., *Science* 251: 1360 (1991).

35 Both methods rely on binding of the polynucleotide to a complementary DNA or RNA. For these techniques, preferred polynucleotides are usually oligonucleotides 20 to 40 bases in length and

complementary to either the region of the gene involved in transcription (triple helix - see Lee et al., Nucl. Acids Res. 6:3073 (1979); Cooney et al., Science 241:456 (1988); and Dervan et al., Science 251:1360 (1991)) or to the mRNA itself (antisense - Okano, J. Neurochem. 56:560 (1991); Oligodeoxy-nucleotides as Antisense Inhibitors of Gene Expression, CRC Press, Boca Raton, FL (1988)). Triple helix formation optimally results in a shut-off of RNA transcription from DNA, while antisense RNA hybridization blocks translation of an mRNA molecule into polypeptide. The oligonucleotide described above can also be delivered to cells such that the antisense RNA or DNA may be expressed *in vivo* to inhibit production of polypeptide of the present invention antigens. Both techniques are effective in model systems, and the information disclosed herein can be used to design antisense or triple helix polynucleotides in an effort to treat disease, and in particular, for the treatment of proliferative diseases and/or conditions. Non-limiting antisense and triple helix methods encompassed by the present invention are more thoroughly described elsewhere herein (see, e.g., the section labeled "Antisense and Ribozyme (Antagonists)").

Polynucleotides of the present invention are also useful in gene therapy. One goal of gene therapy is to insert a normal gene into an organism having a defective gene, in an effort to correct the genetic defect. The polynucleotides disclosed in the present invention offer a means of targeting such genetic defects in a highly accurate manner. Another goal is to insert a new gene that was not present in the host genome, thereby producing a new trait in the host cell. Additional non-limiting examples of gene therapy methods encompassed by the present invention are more thoroughly described elsewhere herein (see, e.g., the sections labeled "Gene Therapy Methods", and Examples 16, 17 and 18).

The polynucleotides are also useful for identifying individuals from minute biological samples. The United States military, for example, is considering the use of restriction fragment length polymorphism (RFLP) for identification of its personnel. In this technique, an individual's genomic DNA is digested with one or more restriction enzymes, and probed on a Southern blot to yield unique bands for identifying personnel. This method does not suffer from the current limitations of "Dog Tags" which can be lost, switched, or stolen, making positive identification difficult. The polynucleotides of the present invention can be used as additional DNA markers for RFLP.

The polynucleotides of the present invention can also be used as an alternative to RFLP, by determining the actual base-by-base DNA sequence of selected portions of an individual's genome. These sequences can be used to prepare PCR primers for amplifying and isolating such selected DNA, which can then be sequenced. Using this technique, individuals can be identified because each individual will have a unique set of DNA sequences. Once an unique ID database is established for an individual, positive identification of that individual, living or dead, can be made from extremely small tissue samples.

Forensic biology also benefits from using DNA-based identification techniques as disclosed herein. DNA sequences taken from very small biological samples such as tissues, e.g., hair or skin, or body fluids, e.g., blood, saliva, semen, synovial fluid, amniotic fluid, breast milk, lymph, pulmonary sputum or surfactant, urine, fecal matter, etc., can be amplified using PCR. In one prior art technique, gene sequences amplified from polymorphic loci, such as DQa class II HLA gene, are used in forensic biology to identify individuals. (Erich, H., PCR Technology, Freeman and Co. (1992)). Once these specific polymorphic loci are amplified, they are digested with one or more restriction enzymes, yielding an identifying set of bands on a Southern blot probed with DNA corresponding to the DQa class II HLA gene. Similarly, polynucleotides of the present invention can be used as polymorphic markers for forensic purposes.

There is also a need for reagents capable of identifying the source of a particular tissue. Such need arises, for example, in forensics when presented with tissue of unknown origin. Appropriate reagents can comprise, for example, DNA probes or primers prepared from the sequences of the present invention, specific to tissues, including but not limited to those shown in Table 1B. Panels of such reagents can identify tissue by species and/or by organ type. In a similar fashion, these reagents can be used to screen tissue cultures for contamination. Additional non-limiting examples of such uses are further described herein.

The polynucleotides of the present invention are also useful as hybridization probes for differential identification of the tissue(s) or cell type(s) present in a biological sample. Similarly, polypeptides and antibodies directed to polypeptides of the present invention are useful to provide immunological probes for differential identification of the tissue(s) (e.g., immunohistochemistry assays) or cell type(s) (e.g., immunocytochemistry assays). In addition, for a number of disorders of the above tissues or cells, significantly higher or lower levels of gene expression of the polynucleotides/polypeptides of the present invention may be detected in certain tissues (e.g., tissues expressing polypeptides and/or polynucleotides of the present invention, for example, those disclosed in Table 1B, and/or cancerous and/or wounded tissues) or bodily fluids (e.g., semen, lymph, vaginal pool, serum, plasma, urine, synovial fluid or spinal fluid) taken from an individual having such a disorder, relative to a "standard" gene expression level, i.e., the expression level in healthy tissue from an individual not having the disorder.

Thus, the invention provides a diagnostic method of a disorder, which involves: (a) assaying gene expression level in cells or body fluid of an individual; (b) comparing the gene expression level with a standard gene expression level, whereby an increase or decrease in the assayed gene expression level compared to the standard expression level is indicative of a disorder.

In the very least, the polynucleotides of the present invention can be used as molecular weight markers on Southern gels, as diagnostic probes for the presence of a specific mRNA in a

particular cell type, as a probe to "subtract-out" known sequences in the process of discovering novel polynucleotides, for selecting and making oligomers for attachment to a "gene chip" or other support, to raise anti-DNA antibodies using DNA immunization techniques, and as an antigen to elicit an immune response.

5

#### Uses of the Polypeptides

Each of the polypeptides identified herein can be used in numerous ways. The following description should be considered exemplary and utilizes known techniques.

Polypeptides and antibodies directed to polypeptides of the present invention are  
 10 useful to provide immunological probes for differential identification of the tissue(s) (e.g., immunohistochemistry assays such as, for example, ABC immunoperoxidase (Hsu et al., J. Histochem. Cytochem. 29:577-580 (1981)) or cell type(s) (e.g., immunocytochemistry assays).

Antibodies can be used to assay levels of polypeptides encoded by polynucleotides of the invention in a biological sample using classical immunohistological methods known to those  
 15 of skill in the art (e.g., see Jalkanen, et al., J. Cell. Biol. 101:976-985 (1985); Jalkanen, et al., J. Cell. Biol. 105:3087-3096 (1987)). Other antibody-based methods useful for detecting protein gene expression include immunoassays, such as the enzyme linked immunosorbent assay (ELISA) and the radioimmunoassay (RIA). Suitable antibody assay labels are known in the art and include enzyme labels, such as, glucose oxidase; radioisotopes, such as iodine ( $^{131}\text{I}$ ,  $^{125}\text{I}$ ,  $^{123}\text{I}$ ,  
 20  $^{121}\text{I}$ ), carbon ( $^{14}\text{C}$ ), sulfur ( $^{35}\text{S}$ ), tritium ( $^3\text{H}$ ), indium ( $^{115\text{m}}\text{In}$ ,  $^{113\text{m}}\text{In}$ ,  $^{112}\text{In}$ ,  $^{111}\text{In}$ ), and technetium ( $^{99\text{m}}\text{Tc}$ ,  $^{99\text{m}}\text{Tc}$ ), thallium ( $^{201}\text{Tl}$ ), gallium ( $^{68}\text{Ga}$ ,  $^{67}\text{Ga}$ ), palladium ( $^{103}\text{Pd}$ ), molybdenum ( $^{99}\text{Mo}$ ), xenon ( $^{133}\text{Xe}$ ), fluorine ( $^{18}\text{F}$ ),  $^{153}\text{Sm}$ ,  $^{177}\text{Lu}$ ,  $^{159}\text{Gd}$ ,  $^{149}\text{Pm}$ ,  $^{140}\text{La}$ ,  $^{175}\text{Yb}$ ,  $^{166}\text{Ho}$ ,  $^{90}\text{Y}$ ,  $^{47}\text{Sc}$ ,  $^{186}\text{Re}$ ,  $^{188}\text{Re}$ ,  $^{142}\text{Pr}$ ,  $^{105}\text{Rh}$ ,  $^{97}\text{Ru}$ ; luminescent labels, such as luminol; and fluorescent labels, such as fluorescein and rhodamine, and biotin.

25 In addition to assaying levels of polypeptide of the present invention in a biological sample, proteins can also be detected *in vivo* by imaging. Antibody labels or markers for *in vivo* imaging of protein include those detectable by X-radiography, NMR or ESR. For X-radiography, suitable labels include radioisotopes such as barium or cesium, which emit detectable radiation but are not overtly harmful to the subject. Suitable markers for NMR and ESR include those with a  
 30 detectable characteristic spin, such as deuterium, which may be incorporated into the antibody by labeling of nutrients for the relevant hybridoma.

A protein-specific antibody or antibody fragment which has been labeled with an appropriate detectable imaging moiety, such as a radioisotope (for example,  $^{131}\text{I}$ ,  $^{112}\text{In}$ ,  $^{99\text{m}}\text{Tc}$ , ( $^{131}\text{I}$ ,  $^{125}\text{I}$ ,  $^{123}\text{I}$ ,  $^{121}\text{I}$ ), carbon ( $^{14}\text{C}$ ), sulfur ( $^{35}\text{S}$ ), tritium ( $^3\text{H}$ ), indium ( $^{115\text{m}}\text{In}$ ,  $^{113\text{m}}\text{In}$ ,  $^{112}\text{In}$ ,  $^{111}\text{In}$ ), and  
 35 technetium ( $^{99\text{m}}\text{Tc}$ ,  $^{99\text{m}}\text{Tc}$ ), thallium ( $^{201}\text{Tl}$ ), gallium ( $^{68}\text{Ga}$ ,  $^{67}\text{Ga}$ ), palladium ( $^{103}\text{Pd}$ ), molybdenum ( $^{99}\text{Mo}$ ), xenon ( $^{133}\text{Xe}$ ), fluorine ( $^{18}\text{F}$ ,  $^{153}\text{Sm}$ ,  $^{177}\text{Lu}$ ,  $^{159}\text{Gd}$ ,  $^{149}\text{Pm}$ ,  $^{140}\text{La}$ ,  $^{175}\text{Yb}$ ,  $^{166}\text{Ho}$ ,  $^{90}\text{Y}$ ,  $^{47}\text{Sc}$ ,  $^{186}\text{Re}$ ,

<sup>188</sup>Re, <sup>142</sup>Pr, <sup>105</sup>Rh, <sup>97</sup>Ru), a radio-opaque substance, or a material detectable by nuclear magnetic resonance, is introduced (for example, parenterally, subcutaneously or intraperitoneally) into the mammal to be examined for immune system disorder. It will be understood in the art that the size of the subject and the imaging system used will determine the quantity of imaging moiety needed to produce diagnostic images. In the case of a radioisotope moiety, for a human subject, the quantity of radioactivity injected will normally range from about 5 to 20 millicuries of <sup>99m</sup>Tc. The labeled antibody or antibody fragment will then preferentially accumulate at the location of cells which express the polypeptide encoded by a polynucleotide of the invention. *In vivo* tumor imaging is described in S.W. Burchiel et al., "Immunopharmacokinetics of Radiolabeled Antibodies and Their Fragments" (Chapter 13 in *Tumor Imaging: The Radiochemical Detection of Cancer*, S.W. Burchiel and B. A. Rhodes, eds., Masson Publishing Inc. (1982)).

In one embodiment, the invention provides a method for the specific delivery of compositions of the invention to cells by administering polypeptides of the invention (e.g., polypeptides encoded by polynucleotides of the invention and/or antibodies) that are associated with heterologous polypeptides or nucleic acids. In one example, the invention provides a method for delivering a therapeutic protein into the targeted cell. In another example, the invention provides a method for delivering a single stranded nucleic acid (e.g., antisense or ribozymes) or double stranded nucleic acid (e.g., DNA that can integrate into the cell's genome or replicate episomally and that can be transcribed) into the targeted cell.

In another embodiment, the invention provides a method for the specific destruction of cells (e.g., the destruction of tumor cells) by administering polypeptides of the invention in association with toxins or cytotoxic prodrugs.

By "toxin" is meant one or more compounds that bind and activate endogenous cytotoxic effector systems, radioisotopes, holotoxins, modified toxins, catalytic subunits of toxins, or any molecules or enzymes not normally present in or on the surface of a cell that under defined conditions cause the cell's death. Toxins that may be used according to the methods of the invention include, but are not limited to, radioisotopes known in the art, compounds such as, for example, antibodies (or complement fixing containing portions thereof) that bind an inherent or induced endogenous cytotoxic effector system, thymidine kinase, endonuclease, RNase, alpha toxin, ricin, abrin, *Pseudomonas* exotoxin A, diphtheria toxin, saporin, momordin, gelonin, pokeweed antiviral protein, alpha-sarcin and cholera toxin. "Toxin" also includes a cytostatic or cytotoxic agent, a therapeutic agent or a radioactive metal ion, e.g., alpha-emitters such as, for example, <sup>213</sup>Bi, or other radioisotopes such as, for example, <sup>103</sup>Pd, <sup>133</sup>Xe, <sup>131</sup>I, <sup>68</sup>Ge, <sup>57</sup>Co, <sup>65</sup>Zn, <sup>85</sup>Sr, <sup>32</sup>P, <sup>35</sup>S, <sup>90</sup>Y, <sup>153</sup>Sm, <sup>153</sup>Gd, <sup>169</sup>Yb, <sup>51</sup>Cr, <sup>54</sup>Mn, <sup>75</sup>Se, <sup>113</sup>Sn, <sup>90</sup>Yttrium, <sup>117</sup>Tin, <sup>186</sup>Rhenium, <sup>166</sup>Holmium, and <sup>188</sup>Rhenium; luminescent labels, such as luminol; and fluorescent labels, such as fluorescein and rhodamine, and biotin. In a specific embodiment, the invention provides a method



for the specific destruction of cells (e.g., the destruction of tumor cells) by administering polypeptides of the invention or antibodies of the invention in association with the radioisotope  $^{90}\text{Y}$ . In another specific embodiment, the invention provides a method for the specific destruction of cells (e.g., the destruction of tumor cells) by administering polypeptides of the invention or antibodies of the invention in association with the radioisotope  $^{111}\text{In}$ . In a further specific embodiment, the invention provides a method for the specific destruction of cells (e.g., the destruction of tumor cells) by administering polypeptides of the invention or antibodies of the invention in association with the radioisotope  $^{131}\text{I}$ .

Techniques known in the art may be applied to label polypeptides of the invention (including antibodies). Such techniques include, but are not limited to, the use of bifunctional conjugating agents (see e.g., U.S. Patent Nos. 5,756,065; 5,714,631; 5,696,239; 5,652,361; 5,505,931; 5,489,425; 5,435,990; 5,428,139; 5,342,604; 5,274,119; 4,994,560; and 5,808,003; the contents of each of which are hereby incorporated by reference in its entirety).

Thus, the invention provides a diagnostic method of a disorder, which involves (a) assaying the expression level of a polypeptide of the present invention in cells or body fluid of an individual; and (b) comparing the assayed polypeptide expression level with a standard polypeptide expression level, whereby an increase or decrease in the assayed polypeptide expression level compared to the standard expression level is indicative of a disorder. With respect to cancer, the presence of a relatively high amount of transcript in biopsied tissue from an individual may indicate a predisposition for the development of the disease, or may provide a means for detecting the disease prior to the appearance of actual clinical symptoms. A more definitive diagnosis of this type may allow health professionals to employ preventative measures or aggressive treatment earlier thereby preventing the development or further progression of the cancer.

Moreover, polypeptides of the present invention can be used to treat or prevent diseases or conditions such as, for example, neural disorders, immune system disorders, muscular disorders, reproductive disorders, gastrointestinal disorders, pulmonary disorders, cardiovascular disorders, renal disorders, proliferative disorders, and/or cancerous diseases and conditions. For example, patients can be administered a polypeptide of the present invention in an effort to replace absent or decreased levels of the polypeptide (e.g., insulin), to supplement absent or decreased levels of a different polypeptide (e.g., hemoglobin S for hemoglobin B, SOD, catalase, DNA repair proteins), to inhibit the activity of a polypeptide (e.g., an oncogene or tumor suppressor), to activate the activity of a polypeptide (e.g., by binding to a receptor), to reduce the activity of a membrane bound receptor by competing with it for free ligand (e.g., soluble TNF receptors used in reducing inflammation), or to bring about a desired response (e.g., blood vessel growth inhibition, enhancement of the immune response to proliferative cells or tissues).

Similarly, antibodies directed to a polypeptide of the present invention can also be used to treat disease (as described *supra*, and elsewhere herein). For example, administration of an antibody directed to a polypeptide of the present invention can bind, and/or neutralize the polypeptide, and/or reduce overproduction of the polypeptide. Similarly, administration of an antibody can activate the polypeptide, such as by binding to a polypeptide bound to a membrane (receptor).

At the very least, the polypeptides of the present invention can be used as molecular weight markers on SDS-PAGE gels or on molecular sieve gel filtration columns using methods well known to those of skill in the art. Polypeptides can also be used to raise antibodies, which in turn are used to measure protein expression from a recombinant cell, as a way of assessing transformation of the host cell. Moreover, the polypeptides of the present invention can be used to test the biological activities described herein.

#### *Diagnostic Assays*

The compounds of the present invention are useful for diagnosis, treatment, prevention and/or prognosis of various disorders in mammals, preferably humans. Such disorders include, but are not limited to, those related to biological activities described in Table 1D and, also as described herein under the section heading "Biological Activities".

For a number of disorders, substantially altered (increased or decreased) levels of gene expression can be detected in tissues, cells or bodily fluids (e.g., sera, plasma, urine, semen, synovial fluid or spinal fluid) taken from an individual having such a disorder, relative to a "standard" gene expression level, that is, the expression level in tissues or bodily fluids from an individual not having the disorder. Thus, the invention provides a diagnostic method useful during diagnosis of a disorder, which involves measuring the expression level of the gene encoding the polypeptide in tissues, cells or body fluid from an individual and comparing the measured gene expression level with a standard gene expression level, whereby an increase or decrease in the gene expression level(s) compared to the standard is indicative of a disorder. These diagnostic assays may be performed *in vivo* or *in vitro*, such as, for example, on blood samples, biopsy tissue or autopsy tissue.

The present invention is also useful as a prognostic indicator, whereby patients exhibiting enhanced or depressed gene expression will experience a worse clinical outcome relative to patients expressing the gene at a level nearer the standard level.

In certain embodiments, a polypeptide of the invention, or polynucleotides, antibodies, agonists, or antagonists corresponding to that polypeptide, may be used to diagnose and/or prognosticate diseases and/or disorders associated with the tissue(s) in which the polypeptide of the invention is expressed, including one, two, three, four, five, or more tissues disclosed in Table

1B.2, column 5 (Tissue Distribution Library Code).

By "assaying the expression level of the gene encoding the polypeptide" is intended qualitatively or quantitatively measuring or estimating the level of the polypeptide of the invention or the level of the mRNA encoding the polypeptide of the invention in a first biological sample either directly (e.g., by determining or estimating absolute protein level or mRNA level) or  
5 relatively (e.g., by comparing to the polypeptide level or mRNA level in a second biological sample). Preferably, the polypeptide expression level or mRNA level in the first biological sample is measured or estimated and compared to a standard polypeptide level or mRNA level, the standard being taken from a second biological sample obtained from an individual not having the  
10 disorder or being determined by averaging levels from a population of individuals not having the disorder. As will be appreciated in the art, once a standard polypeptide level or mRNA level is known, it can be used repeatedly as a standard for comparison.

By "biological sample" is intended any biological sample obtained from an individual, cell line, tissue culture, or other source containing polypeptides of the invention (including  
15 portions thereof) or mRNA. As indicated, biological samples include body fluids (such as sera, plasma, urine, synovial fluid and spinal fluid) and tissue sources found to express the full length or fragments thereof of a polypeptide or mRNA. Methods for obtaining tissue biopsies and body fluids from mammals are well known in the art. Where the biological sample is to include mRNA, a tissue biopsy is the preferred source.

20 Total cellular RNA can be isolated from a biological sample using any suitable technique such as the single-step guanidinium-thiocyanate-phenol-chloroform method described in Chomczynski and Sacchi, Anal. Biochem. 162:156-159 (1987). Levels of mRNA encoding the polypeptides of the invention are then assayed using any appropriate method. These include Northern blot analysis, S1 nuclease mapping, the polymerase chain reaction (PCR), reverse  
25 transcription in combination with the polymerase chain reaction (RT-PCR), and reverse transcription in combination with the ligase chain reaction (RT-LCR).

The present invention also relates to diagnostic assays such as quantitative and diagnostic assays for detecting levels of polypeptides of the invention, in a biological sample (e.g., cells and tissues), including determination of normal and abnormal levels of polypeptides. Thus,  
30 for instance, a diagnostic assay in accordance with the invention for detecting over-expression of polypeptides of the invention compared to normal control tissue samples may be used to detect the presence of tumors. Assay techniques that can be used to determine levels of a polypeptide, such as a polypeptide of the present invention in a sample derived from a host are well-known to those of skill in the art. Such assay methods include radioimmunoassays, competitive-binding assays,  
35 Western Blot analysis and ELISA assays. Assaying polypeptide levels in a biological sample can occur using any art-known method.

Assaying polypeptide levels in a biological sample can occur using antibody-based techniques. For example, polypeptide expression in tissues can be studied with classical immunohistological methods (Jalkanen et al., J. Cell. Biol. 101:976-985 (1985); Jalkanen, M., et al., J. Cell. Biol. 105:3087-3096 (1987)). Other antibody-based methods useful for detecting  
5 polypeptide gene expression include immunoassays, such as the enzyme linked immunosorbent assay (ELISA) and the radioimmunoassay (RIA). Suitable antibody assay labels are known in the art and include enzyme labels, such as, glucose oxidase, and radioisotopes, such as iodine ( $^{125}\text{I}$ ,  $^{121}\text{I}$ ), carbon ( $^{14}\text{C}$ ), sulfur ( $^{35}\text{S}$ ), tritium ( $^3\text{H}$ ), indium ( $^{112}\text{In}$ ), and technetium ( $^{99\text{m}}\text{Tc}$ ), and fluorescent labels, such as fluorescein and rhodamine, and biotin.

10 The tissue or cell type to be analyzed will generally include those which are known, or suspected, to express the gene of interest (such as, for example, cancer). The protein isolation methods employed herein may, for example, be such as those described in Harlow and Lane (Harlow, E. and Lane, D., 1988, "Antibodies: A Laboratory Manual", Cold Spring Harbor Laboratory Press, Cold Spring Harbor, New York), which is incorporated herein by reference in its  
15 entirety. The isolated cells can be derived from cell culture or from a patient. The analysis of cells taken from culture may be a necessary step in the assessment of cells that could be used as part of a cell-based gene therapy technique or, alternatively, to test the effect of compounds on the expression of the gene.

For example, antibodies, or fragments of antibodies, such as those described herein,  
20 may be used to quantitatively or qualitatively detect the presence of gene products or conserved variants or peptide fragments thereof. This can be accomplished, for example, by immunofluorescence techniques employing a fluorescently labeled antibody coupled with light microscopic, flow cytometric, or fluorimetric detection.

In a preferred embodiment, antibodies, or fragments of antibodies directed to any one  
25 or all of the predicted epitope domains of the polypeptides of the invention (shown in Table 1B) may be used to quantitatively or qualitatively detect the presence of gene products or conserved variants or peptide fragments thereof. This can be accomplished, for example, by immunofluorescence techniques employing a fluorescently labeled antibody coupled with light microscopic, flow cytometric, or fluorimetric detection.

30 In an additional preferred embodiment, antibodies, or fragments of antibodies directed to a conformational epitope of a polypeptide of the invention may be used to quantitatively or qualitatively detect the presence of gene products or conserved variants or peptide fragments thereof. This can be accomplished, for example, by immunofluorescence techniques employing a fluorescently labeled antibody coupled with light microscopic, flow cytometric, or fluorimetric  
35 detection.

The antibodies (or fragments thereof), and/or polypeptides of the present invention

may, additionally, be employed histologically, as in immunofluorescence, immunoelectron microscopy or non-immunological assays, for in situ detection of gene products or conserved variants or peptide fragments thereof. In situ detection may be accomplished by removing a histological specimen from a patient, and applying thereto a labeled antibody or polypeptide of the present invention. The antibody (or fragment thereof) or polypeptide is preferably applied by overlaying the labeled antibody (or fragment) onto a biological sample. Through the use of such a procedure, it is possible to determine not only the presence of the gene product, or conserved variants or peptide fragments, or polypeptide binding, but also its distribution in the examined tissue. Using the present invention, those of ordinary skill will readily perceive that any of a wide variety of histological methods (such as staining procedures) can be modified in order to achieve such in situ detection.

Immunoassays and non-immunoassays for gene products or conserved variants or peptide fragments thereof will typically comprise incubating a sample, such as a biological fluid, a tissue extract, freshly harvested cells, or lysates of cells which have been incubated in cell culture, in the presence of a detectably labeled antibody capable of binding gene products or conserved variants or peptide fragments thereof, and detecting the bound antibody by any of a number of techniques well-known in the art.

The biological sample may be brought in contact with and immobilized onto a solid phase support or carrier such as nitrocellulose, or other solid support that is capable of immobilizing cells, cell particles or soluble proteins. The support may then be washed with suitable buffers followed by treatment with the detectably labeled antibody or detectable polypeptide of the invention. The solid phase support may then be washed with the buffer a second time to remove unbound antibody or polypeptide. Optionally the antibody is subsequently labeled. The amount of bound label on solid support may then be detected by conventional means.

By "solid phase support or carrier" is intended any support capable of binding an antigen or an antibody. Well-known supports or carriers include glass, polystyrene, polypropylene, polyethylene, dextran, nylon, amylases, natural and modified celluloses, polyacrylamides, gabbros, and magnetite. The nature of the carrier can be either soluble to some extent or insoluble for the purposes of the present invention. The support material may have virtually any possible structural configuration so long as the coupled molecule is capable of binding to an antigen or antibody. Thus, the support configuration may be spherical, as in a bead, or cylindrical, as in the inside surface of a test tube, or the external surface of a rod. Alternatively, the surface may be flat such as a sheet, test strip, etc. Preferred supports include polystyrene beads. Those skilled in the art will know many other suitable carriers for binding antibody or antigen, or will be able to ascertain the same by use of routine experimentation.

The binding activity of a given lot of antibody or antigen polypeptide may be

determined according to well known methods. Those skilled in the art will be able to determine operative and optimal assay conditions for each determination by employing routine experimentation.

5 In addition to assaying polypeptide levels or polynucleotide levels in a biological sample obtained from an individual, polypeptide or polynucleotide can also be detected *in vivo* by imaging. For example, in one embodiment of the invention, polypeptides and/or antibodies of the invention are used to image diseased cells, such as neoplasms. In another embodiment, polynucleotides of the invention (e.g., polynucleotides complementary to all or a portion of an mRNA) and/or antibodies (e.g., antibodies directed to any one or a combination of the epitopes of  
10 a polypeptide of the invention, antibodies directed to a conformational epitope of a polypeptide of the invention, or antibodies directed to the full length polypeptide expressed on the cell surface of a mammalian cell) are used to image diseased or neoplastic cells.

Antibody labels or markers for *in vivo* imaging of polypeptides of the invention include those detectable by X-radiography, NMR, MRI, CAT-scans or ESR. For X-radiography,  
15 suitable labels include radioisotopes such as barium or cesium, which emit detectable radiation but are not overtly harmful to the subject. Suitable markers for NMR and ESR include those with a detectable characteristic spin, such as deuterium, which may be incorporated into the antibody by labeling of nutrients for the relevant hybridoma. Where *in vivo* imaging is used to detect enhanced levels of polypeptides for diagnosis in humans, it may be preferable to use human antibodies or  
20 "humanized" chimeric monoclonal antibodies. Such antibodies can be produced using techniques described herein or otherwise known in the art. For example methods for producing chimeric antibodies are known in the art. See, for review, Morrison, *Science* 229:1202 (1985); Oi et al., *BioTechniques* 4:214 (1986); Cabilly et al., U.S. Patent No. 4,816,567; Taniguchi et al., EP 171496; Morrison et al., EP 173494; Neuberger et al., WO 8601533; Robinson et al., WO  
25 8702671; Boulianne et al., *Nature* 312:643 (1984); Neuberger et al., *Nature* 314:268 (1985).

Additionally, any polypeptides of the invention whose presence can be detected, can be administered. For example, polypeptides of the invention labeled with a radio-opaque or other appropriate compound can be administered and visualized *in vivo*, as discussed, above for labeled antibodies. Further, such polypeptides can be utilized for *in vitro* diagnostic procedures.

30 A polypeptide-specific antibody or antibody fragment that has been labeled with an appropriate detectable imaging moiety, such as a radioisotope (for example,  $^{131}\text{I}$ ,  $^{112}\text{In}$ ,  $^{99\text{m}}\text{Tc}$ ), a radio-opaque substance, or a material detectable by nuclear magnetic resonance, is introduced (for example, parenterally, subcutaneously or intraperitoneally) into the mammal to be examined for a disorder. It will be understood in the art that the size of the subject and the imaging system used  
35 will determine the quantity of imaging moiety needed to produce diagnostic images. In the case of a radioisotope moiety, for a human subject, the quantity of radioactivity injected will normally

range from about 5 to 20 millicuries of  $^{99m}\text{Tc}$ . The labeled antibody or antibody fragment will then preferentially accumulate at the location of cells which contain the antigenic protein. *In vivo* tumor imaging is described in S.W. Burchiel et al., "Immunopharmacokinetics of Radiolabeled Antibodies and Their Fragments" (Chapter 13 in *Tumor Imaging: The Radiochemical Detection of Cancer*, S.W. Burchiel and B. A. Rhodes, eds., Masson Publishing Inc. (1982)).

With respect to antibodies, one of the ways in which an antibody of the present invention can be detectably labeled is by linking the same to a reporter enzyme and using the linked product in an enzyme immunoassay (EIA) (Voller, A., "The Enzyme Linked Immunosorbent Assay (ELISA)", 1978, *Diagnostic Horizons* 2:1-7, Microbiological Associates Quarterly Publication, Walkersville, MD); Voller et al., *J. Clin. Pathol.* 31:507-520 (1978); Butler, J.E., *Meth. Enzymol.* 73:482-523 (1981); Maggio, E. (ed.), 1980, *Enzyme Immunoassay*, CRC Press, Boca Raton, FL.; Ishikawa, E. et al., (eds.), 1981, *Enzyme Immunoassay*, Kaku Shoin, Tokyo). The reporter enzyme which is bound to the antibody will react with an appropriate substrate, preferably a chromogenic substrate, in such a manner as to produce a chemical moiety which can be detected, for example, by spectrophotometric, fluorimetric or by visual means. Reporter enzymes which can be used to detectably label the antibody include, but are not limited to, malate dehydrogenase, staphylococcal nuclease, delta-5-steroid isomerase, yeast alcohol dehydrogenase, alpha-glycerophosphate dehydrogenase, triose phosphate isomerase, horseradish peroxidase, alkaline phosphatase, asparaginase, glucose oxidase, beta-galactosidase, ribonuclease, urease, catalase, glucose-6-phosphate dehydrogenase, glucoamylase and acetylcholinesterase. Additionally, the detection can be accomplished by colorimetric methods which employ a chromogenic substrate for the reporter enzyme. Detection may also be accomplished by visual comparison of the extent of enzymatic reaction of a substrate in comparison with similarly prepared standards.

Detection may also be accomplished using any of a variety of other immunoassays. For example, by radioactively labeling the antibodies or antibody fragments, it is possible to detect polypeptides through the use of a radioimmunoassay (RIA) (see, for example, Weintraub, B., *Principles of Radioimmunoassays*, Seventh Training Course on Radioligand Assay Techniques, The Endocrine Society, March, 1986, which is incorporated by reference herein). The radioactive isotope can be detected by means including, but not limited to, a gamma counter, a scintillation counter, or autoradiography.

It is also possible to label the antibody with a fluorescent compound. When the fluorescently labeled antibody is exposed to light of the proper wave length, its presence can then be detected due to fluorescence. Among the most commonly used fluorescent labeling compounds are fluorescein isothiocyanate, rhodamine, phycoerythrin, phycocyanin, allophycocyanin, ophthaldehyde and fluorescamine.

The antibody can also be detectably labeled using fluorescence emitting metals such as  $^{152}\text{Eu}$ , or others of the lanthanide series. These metals can be attached to the antibody using such metal chelating groups as diethylenetriaminepentacetic acid (DTPA) or ethylenediaminetetraacetic acid (EDTA).

5           The antibody also can be detectably labeled by coupling it to a chemiluminescent compound. The presence of the chemiluminescent-tagged antibody is then determined by detecting the presence of luminescence that arises during the course of a chemical reaction. Examples of particularly useful chemiluminescent labeling compounds are luminol, isoluminol, therrromatic acridinium ester, imidazole, acridinium salt and oxalate ester.

10           Likewise, a bioluminescent compound may be used to label the antibody of the present invention. Bioluminescence is a type of chemiluminescence found in biological systems in, which a catalytic protein increases the efficiency of the chemiluminescent reaction. The presence of a bioluminescent protein is determined by detecting the presence of luminescence. Important bioluminescent compounds for purposes of labeling are luciferin, luciferase and  
15           aequorin.

#### Methods for Detecting Diseases

In general, a disease may be detected in a patient based on the presence of one or more proteins of the invention and/or polynucleotides encoding such proteins in a biological sample (for  
20           example, blood, sera, urine, and/or tumor biopsies) obtained from the patient. In other words, such proteins may be used as markers to indicate the presence or absence of a disease or disorder, including cancer and/or as described elsewhere herein. In addition, such proteins may be useful for the detection of other diseases and cancers. The binding agents provided herein generally permit detection of the level of antigen that binds to the agent in the biological sample. Polynucleotide  
25           primers and probes may be used to detect the level of mRNA encoding polypeptides of the invention, which is also indicative of the presence or absence of a disease or disorder, including cancer. In general, polypeptides of the invention should be present at a level that is at least three fold higher in diseased tissue than in normal tissue.

There are a variety of assay formats known to those of ordinary skill in the art for  
30           using a binding agent to detect polypeptide markers in a sample. See, e.g., Harlow and Lane, *supra*. In general, the presence or absence of a disease in a patient may be determined by (a) contacting a biological sample obtained from a patient with a binding agent; (b) detecting in the sample a level of polypeptide that binds to the binding agent; and (c) comparing the level of polypeptide with a predetermined cut-off value.

35           In a preferred embodiment, the assay involves the use of a binding agent(s) immobilized on a solid support to bind to and remove the polypeptide of the invention from the



remainder of the sample. The bound polypeptide may then be detected using a detection reagent that contains a reporter group and specifically binds to the binding agent/polypeptide complex. Such detection reagents may comprise, for example, a binding agent that specifically binds to the polypeptide or an antibody or other agent that specifically binds to the binding agent, such as an anti-immunoglobulin, protein G, protein A or a lectin. Alternatively, a competitive assay may be utilized, in which a polypeptide is labeled with a reporter group and allowed to bind to the immobilized binding agent after incubation of the binding agent with the sample. The extent to which components of the sample inhibit the binding of the labeled polypeptide to the binding agent is indicative of the reactivity of the sample with the immobilized binding agent. Suitable polypeptides for use within such assays include polypeptides of the invention and portions thereof, or antibodies, to which the binding agent binds, as described above.

The solid support may be any material known to those of skill in the art to which polypeptides of the invention may be attached. For example, the solid support may be a test well in a microtiter plate or a nitrocellulose or other suitable membrane. Alternatively, the support may be a bead or disc, such as glass fiberglass, latex or a plastic material such as polystyrene or polyvinylchloride. The support may also be a magnetic particle or a fiber optic sensor, such as those disclosed, for example, in U.S. Patent No. 5,359,681. The binding agent may be immobilized on the solid support using a variety of techniques known to those of skill in the art, which are amply described in the patent and scientific literature. In the context of the present invention, the term "immobilization" refers to both noncovalent association, such as adsorption, and covalent attachment (which may be a direct linkage between the agent and functional groups on the support or may be a linkage by way of a cross-linking agent). Immobilization by adsorption to a well in a microtiter plate or to a membrane is preferred. In such cases, adsorption may be achieved by contacting the binding agent, in a suitable buffer, with the solid support for the suitable amount of time. The contact time varies with temperature, but is typically between about 1 hour and about 1 day. In general, contacting a well of plastic microtiter plate (such as polystyrene or polyvinylchloride) with an amount of binding agent ranging from about 10 ng to about 10 ug, and preferably about 100 ng to about 1 ug, is sufficient to immobilize an adequate amount of binding agent.

Covalent attachment of binding agent to a solid support may generally be achieved by first reacting the support with a bifunctional reagent that will react with both the support and a functional group, such as a hydroxyl or amino group, on the binding agent. For example, the binding agent may be covalently attached to supports having an appropriate polymer coating using benzoquinone or by condensation of an aldehyde group on the support with an amine and an active hydrogen on the binding partner (see, e.g., Pierce Immunotechnology Catalog and Handbook, 1991, at A12-A13).

Gene Therapy Methods

Also encompassed by the invention are gene therapy methods for treating or preventing disorders, diseases and conditions. The gene therapy methods relate to the introduction of nucleic acid (DNA, RNA and antisense DNA or RNA) sequences into an animal to achieve expression of the polypeptide of the present invention. This method requires a polynucleotide which codes for a polypeptide of the present invention operatively linked to a promoter and any other genetic elements necessary for the expression of the polypeptide by the target tissue. Such gene therapy and delivery techniques are known in the art, see, for example, WO90/11092, which is herein incorporated by reference.

Thus, for example, cells from a patient may be engineered with a polynucleotide (DNA or RNA) comprising a promoter operably linked to a polynucleotide of the present invention *ex vivo*, with the engineered cells then being provided to a patient to be treated with the polypeptide of the present invention. Such methods are well-known in the art. For example, see Beldegrun, A., et al., J. Natl. Cancer Inst. 85: 207-216 (1993); Ferrantini, M. et al., Cancer Research 53: 1107-1112 (1993); Ferrantini, M. et al., J. Immunology 153: 4604-4615 (1994); Kaido, T., et al., Int. J. Cancer 60: 221-229 (1995); Ogura, H., et al., Cancer Research 50: 5102-5106 (1990); Santodonato, L., et al., Human Gene Therapy 7:1-10 (1996); Santodonato, L., et al., Gene Therapy 4:1246-1255 (1997); and Zhang, J.-F. et al., Cancer Gene Therapy 3: 31-38 (1996)), which are herein incorporated by reference. In one embodiment, the cells which are engineered are arterial cells. The arterial cells may be reintroduced into the patient through direct injection to the artery, the tissues surrounding the artery, or through catheter injection.

As discussed in more detail below, the polynucleotide constructs can be delivered by any method that delivers injectable materials to the cells of an animal, such as, injection into the interstitial space of tissues (heart, muscle, skin, lung, liver, and the like). The polynucleotide constructs may be delivered in a pharmaceutically acceptable liquid or aqueous carrier.

In one embodiment, the polynucleotide of the present invention is delivered as a naked polynucleotide. The term "naked" polynucleotide, DNA or RNA refers to sequences that are free from any delivery vehicle that acts to assist, promote or facilitate entry into the cell, including viral sequences, viral particles, liposome formulations, lipofectin or precipitating agents and the like. However, the polynucleotide of the present invention can also be delivered in liposome formulations and lipofectin formulations and the like can be prepared by methods well known to those skilled in the art. Such methods are described, for example, in U.S. Patent Nos. 5,593,972, 5,589,466, and 5,580,859, which are herein incorporated by reference.

The polynucleotide vector constructs used in the gene therapy method are preferably constructs that will not integrate into the host genome nor will they contain sequences that allow for replication. Appropriate vectors include pWLNEO, pSV2CAT, pOG44, pXT1 and pSG

available from Stratagene; pSVK3, pBPV, pMSG and pSVL available from Pharmacia; and pEF1/V5, pcDNA3.1, and pRc/CMV2 available from Invitrogen. Other suitable vectors will be readily apparent to the skilled artisan.

Any strong promoter known to those skilled in the art can be used for driving the expression of the polynucleotide sequence. Suitable promoters include adenoviral promoters, such as the adenoviral major late promoter; or heterologous promoters, such as the cytomegalovirus (CMV) promoter; the respiratory syncytial virus (RSV) promoter; inducible promoters, such as the MMT promoter, the metallothionein promoter; heat shock promoters; the albumin promoter; the ApoAI promoter; human globin promoters; viral thymidine kinase promoters, such as the Herpes Simplex thymidine kinase promoter; retroviral LTRs; the  $\beta$ -actin promoter; and human growth hormone promoters. The promoter also may be the native promoter for the polynucleotide of the present invention.

Unlike other gene therapy techniques, one major advantage of introducing naked nucleic acid sequences into target cells is the transitory nature of the polynucleotide synthesis in the cells. Studies have shown that non-replicating DNA sequences can be introduced into cells to provide production of the desired polypeptide for periods of up to six months.

The polynucleotide construct can be delivered to the interstitial space of tissues within the an animal, including of muscle, skin, brain, lung, liver, spleen, bone marrow, thymus, heart, lymph, blood, bone, cartilage, pancreas, kidney, gall bladder, stomach, intestine, testis, ovary, uterus, rectum, nervous system, eye, gland, and connective tissue. Interstitial space of the tissues comprises the intercellular, fluid, mucopolysaccharide matrix among the reticular fibers of organ tissues, elastic fibers in the walls of vessels or chambers, collagen fibers of fibrous tissues, or that same matrix within connective tissue ensheathing muscle cells or in the lacunae of bone. It is similarly the space occupied by the plasma of the circulation and the lymph fluid of the lymphatic channels. Delivery to the interstitial space of muscle tissue is preferred for the reasons discussed below. They may be conveniently delivered by injection into the tissues comprising these cells. They are preferably delivered to and expressed in persistent, non-dividing cells which are differentiated, although delivery and expression may be achieved in non-differentiated or less completely differentiated cells, such as, for example, stem cells of blood or skin fibroblasts. *In vivo* muscle cells are particularly competent in their ability to take up and express polynucleotides.

For the naked nucleic acid sequence injection, an effective dosage amount of DNA or RNA will be in the range of from about 0.05 mg/kg body weight to about 50 mg/kg body weight. Preferably the dosage will be from about 0.005 mg/kg to about 20 mg/kg and more preferably from about 0.05 mg/kg to about 5 mg/kg. Of course, as the artisan of ordinary skill will appreciate, this dosage will vary according to the tissue site of injection. The appropriate and effective dosage of

nucleic acid sequence can readily be determined by those of ordinary skill in the art and may depend on the condition being treated and the route of administration.

5 The preferred route of administration is by the parenteral route of injection into the interstitial space of tissues. However, other parenteral routes may also be used, such as, inhalation of an aerosol formulation particularly for delivery to lungs or bronchial tissues, throat or mucous membranes of the nose. In addition, naked DNA constructs can be delivered to arteries during angioplasty by the catheter used in the procedure.

10 The naked polynucleotides are delivered by any method known in the art, including, but not limited to, direct needle injection at the delivery site, intravenous injection, topical administration, catheter infusion, and so-called "gene guns". These delivery methods are known in the art.

The constructs may also be delivered with delivery vehicles such as viral sequences, viral particles, liposome formulations, lipofectin, precipitating agents, etc. Such methods of delivery are known in the art.

15 In certain embodiments, the polynucleotide constructs are complexed in a liposome preparation. Liposomal preparations for use in the instant invention include cationic (positively charged), anionic (negatively charged) and neutral preparations. However, cationic liposomes are particularly preferred because a tight charge complex can be formed between the cationic liposome and the polyanionic nucleic acid. Cationic liposomes have been shown to mediate intracellular delivery of plasmid DNA (Felgner et al., Proc. Natl. Acad. Sci. USA (1987) 20 84:7413-7416, which is herein incorporated by reference); mRNA (Malone et al., Proc. Natl. Acad. Sci. USA (1989) 86:6077-6081, which is herein incorporated by reference); and purified transcription factors (Debs et al., J. Biol. Chem. (1990) 265:10189-10192, which is herein incorporated by reference), in functional form.

25 Cationic liposomes are readily available. For example, N[1-2,3-dioleoyloxy)propyl]-N,N,N-triethylammonium (DOTMA) liposomes are particularly useful and are available under the trademark Lipofectin, from GIBCO BRL, Grand Island, N.Y. (See, also, Felgner et al., Proc. Natl Acad. Sci. USA (1987) 84:7413-7416, which is herein incorporated by reference). Other commercially available liposomes include transfectace 30 (DDAB/DOPE) and DOTAP/DOPE (Boehringer).

Other cationic liposomes can be prepared from readily available materials using techniques well known in the art. See, e.g. PCT Publication No. WO 90/11092 (which is herein incorporated by reference) for a description of the synthesis of DOTAP (1,2-bis(oleoyloxy)-3-(trimethylammonio)propane) liposomes. Preparation of DOTMA liposomes is explained in the 35 literature, see, e.g., P. Felgner et al., Proc. Natl. Acad. Sci. USA 84:7413-7417, which is herein

incorporated by reference. Similar methods can be used to prepare liposomes from other cationic lipid materials.

Similarly, anionic and neutral liposomes are readily available, such as from Avanti Polar Lipids (Birmingham, Ala.), or can be easily prepared using readily available materials. Such materials include phosphatidyl, choline, cholesterol, phosphatidyl ethanolamine, dioleoylphosphatidyl choline (DOPC), dioleoylphosphatidyl glycerol (DOPG), dioleoylphosphatidyl ethanolamine (DOPE), among others. These materials can also be mixed with the DOTMA and DOTAP starting materials in appropriate ratios. Methods for making liposomes using these materials are well known in the art.

For example, commercially dioleoylphosphatidyl choline (DOPC), dioleoylphosphatidyl glycerol (DOPG), and dioleoylphosphatidyl ethanolamine (DOPE) can be used in various combinations to make conventional liposomes, with or without the addition of cholesterol. Thus, for example, DOPG/DOPC vesicles can be prepared by drying 50 mg each of DOPG and DOPC under a stream of nitrogen gas into a sonication vial. The sample is placed under a vacuum pump overnight and is hydrated the following day with deionized water. The sample is then sonicated for 2 hours in a capped vial, using a Heat Systems model 350 sonicator equipped with an inverted cup (bath type) probe at the maximum setting while the bath is circulated at 15EC. Alternatively, negatively charged vesicles can be prepared without sonication to produce multilamellar vesicles or by extrusion through nucleopore membranes to produce unilamellar vesicles of discrete size. Other methods are known and available to those of skill in the art.

The liposomes can comprise multilamellar vesicles (MLVs), small unilamellar vesicles (SUVs), or large unilamellar vesicles (LUVs), with SUVs being preferred. The various liposome-nucleic acid complexes are prepared using methods well known in the art. See, e.g., Straubinger et al., *Methods of Immunology* (1983), 101:512-527, which is herein incorporated by reference. For example, MLVs containing nucleic acid can be prepared by depositing a thin film of phospholipid on the walls of a glass tube and subsequently hydrating with a solution of the material to be encapsulated. SUVs are prepared by extended sonication of MLVs to produce a homogeneous population of unilamellar liposomes. The material to be entrapped is added to a suspension of preformed MLVs and then sonicated. When using liposomes containing cationic lipids, the dried lipid film is resuspended in an appropriate solution such as sterile water or an isotonic buffer solution such as 10 mM Tris/NaCl, sonicated, and then the preformed liposomes are mixed directly with the DNA. The liposome and DNA form a very stable complex due to binding of the positively charged liposomes to the cationic DNA. SUVs find use with small nucleic acid fragments. LUVs are prepared by a number of methods, well known in the art. Commonly used methods include  $\text{Ca}^{2+}$ -EDTA chelation (Papahadjopoulos et al., *Biochim.*

Biophys. Acta (1975) 394:483; Wilson et al., Cell 17:77 (1979)); ether injection (Deamer, D. and Bangham, A., Biochim. Biophys. Acta 443:629 (1976); Ostro et al., Biochem. Biophys. Res. Commun. 76:836 (1977); Fraley et al., Proc. Natl. Acad. Sci. USA 76:3348 (1979)); detergent dialysis (Enoch, H. and Strittmatter, P., Proc. Natl. Acad. Sci. USA 76:145 (1979)); and  
5 reverse-phase evaporation (REV) (Fraley et al., J. Biol. Chem. 255:10431 (1980); Szoka, F. and Papahadjopoulos, D., Proc. Natl. Acad. Sci. USA 75:145 (1978); Schaefer-Ridder et al., Science 215:166 (1982)), which are herein incorporated by reference.

Generally, the ratio of DNA to liposomes will be from about 10:1 to about 1:10. Preferably, the ration will be from about 5:1 to about 1:5. More preferably, the ration will be  
10 about 3:1 to about 1:3. Still more preferably, the ratio will be about 1:1.

U.S. Patent No. 5,676,954 (which is herein incorporated by reference) reports on the injection of genetic material, complexed with cationic liposomes carriers, into mice. U.S. Patent Nos. 4,897,355, 4,946,787, 5,049,386, 5,459,127, 5,589,466, 5,693,622, 5,580,859, 5,703,055, and international publication no. WO 94/9469 (which are herein incorporated by reference) provide  
15 cationic lipids for use in transfecting DNA into cells and mammals. U.S. Patent Nos. 5,589,466, 5,693,622, 5,580,859, 5,703,055, and international publication no. WO 94/9469 provide methods for delivering DNA-cationic lipid complexes to mammals.

In certain embodiments, cells are engineered, *ex vivo* or *in vivo*, using a retroviral particle containing RNA which comprises a sequence encoding a polypeptide of the present  
20 invention. Retroviruses from which the retroviral plasmid vectors may be derived include, but are not limited to, Moloney Murine Leukemia Virus, spleen necrosis virus, Rous sarcoma Virus, Harvey Sarcoma Virus, avian leukosis virus, gibbon ape leukemia virus, human immunodeficiency virus, Myeloproliferative Sarcoma Virus, and mammary tumor virus.

The retroviral plasmid vector is employed to transduce packaging cell lines to form  
25 producer cell lines. Examples of packaging cells which may be transfected include, but are not limited to, the PE501, PA317, R-2, R-AM, PA12, T19-14X, VT-19-17-H2, RCRE, RCRIP, GP+E-86, GP+envAm12, and DAN cell lines as described in Miller, Human Gene Therapy 1:5-14 (1990), which is incorporated herein by reference in its entirety. The vector may transduce the packaging cells through any means known in the art. Such means include, but are not limited to,  
30 electroporation, the use of liposomes, and CaPO<sub>4</sub> precipitation. In one alternative, the retroviral plasmid vector may be encapsulated into a liposome, or coupled to a lipid, and then administered to a host.

The producer cell line generates infectious retroviral vector particles which include polynucleotide encoding a polypeptide of the present invention. Such retroviral vector particles  
35 then may be employed, to transduce eukaryotic cells, either *in vitro* or *in vivo*. The transduced eukaryotic cells will express a polypeptide of the present invention.

In certain other embodiments, cells are engineered, *ex vivo* or *in vivo*, with polynucleotide contained in an adenovirus vector. Adenovirus can be manipulated such that it encodes and expresses a polypeptide of the present invention, and at the same time is inactivated in terms of its ability to replicate in a normal lytic viral life cycle. Adenovirus expression is achieved without integration of the viral DNA into the host cell chromosome, thereby alleviating concerns about insertional mutagenesis. Furthermore, adenoviruses have been used as live enteric vaccines for many years with an excellent safety profile (Schwartz et al. *Am. Rev. Respir. Dis.* 109:233-238 (1974)). Finally, adenovirus mediated gene transfer has been demonstrated in a number of instances including transfer of alpha-1-antitrypsin and CFTR to the lungs of cotton rats (Rosenfeld, M. A. et al. (1991) *Science* 252:431-434; Rosenfeld et al., (1992) *Cell* 68:143-155). Furthermore, extensive studies to attempt to establish adenovirus as a causative agent in human cancer were uniformly negative (Green, M. et al. (1979) *Proc. Natl. Acad. Sci. USA* 76:6606).

Suitable adenoviral vectors useful in the present invention are described, for example, in Kozarsky and Wilson, *Curr. Opin. Genet. Devel.* 3:499-503 (1993); Rosenfeld et al., *Cell* 68:143-155 (1992); Engelhardt et al., *Human Genet. Ther.* 4:759-769 (1993); Yang et al., *Nature Genet.* 7:362-369 (1994); Wilson et al., *Nature* 365:691-692 (1993); and U.S. Patent No. 5,652,224, which are herein incorporated by reference. For example, the adenovirus vector Ad2 is useful and can be grown in human 293 cells. These cells contain the E1 region of adenovirus and constitutively express E1a and E1b, which complement the defective adenoviruses by providing the products of the genes deleted from the vector. In addition to Ad2, other varieties of adenovirus (e.g., Ad3, Ad5, and Ad7) are also useful in the present invention.

Preferably, the adenoviruses used in the present invention are replication deficient. Replication deficient adenoviruses require the aid of a helper virus and/or packaging cell line to form infectious particles. The resulting virus is capable of infecting cells and can express a polynucleotide of interest that is operably linked to a promoter, but cannot replicate in most cells. Replication deficient adenoviruses may be deleted in one or more of all or a portion of the following genes: E1a, E1b, E3, E4, E2a, or L1 through L5.

In certain other embodiments, the cells are engineered, *ex vivo* or *in vivo*, using an adeno-associated virus (AAV). AAVs are naturally occurring defective viruses that require helper viruses to produce infectious particles (Muzyczka, N., *Curr. Topics in Microbiol. Immunol.* 158:97 (1992)). It is also one of the few viruses that may integrate its DNA into non-dividing cells. Vectors containing as little as 300 base pairs of AAV can be packaged and can integrate, but space for exogenous DNA is limited to about 4.5 kb. Methods for producing and using such AAVs are known in the art. See, for example, U.S. Patent Nos. 5,139,941, 5,173,414, 5,354,678, 5,436,146, 5,474,935, 5,478,745, and 5,589,377.

For example, an appropriate AAV vector for use in the present invention will include all the sequences necessary for DNA replication, encapsidation, and host-cell integration. The polynucleotide construct is inserted into the AAV vector using standard cloning methods, such as those found in Sambrook et al., *Molecular Cloning: A Laboratory Manual*, Cold Spring Harbor Press (1989). The recombinant AAV vector is then transfected into packaging cells which are infected with a helper virus, using any standard technique, including lipofection, electroporation, calcium phosphate precipitation, etc. Appropriate helper viruses include adenoviruses, cytomegaloviruses, vaccinia viruses, or herpes viruses. Once the packaging cells are transfected and infected, they will produce infectious AAV viral particles which contain the polynucleotide construct. These viral particles are then used to transduce eukaryotic cells, either *ex vivo* or *in vivo*. The transduced cells will contain the polynucleotide construct integrated into its genome, and will express a polypeptide of the invention.

Another method of gene therapy involves operably associating heterologous control regions and endogenous polynucleotide sequences (e.g. encoding a polypeptide of the present invention) via homologous recombination (see, e.g., U.S. Patent No. 5,641,670, issued June 24, 1997; International Publication No. WO 96/29411, published September 26, 1996; International Publication No. WO 94/12650, published August 4, 1994; Koller et al., *Proc. Natl. Acad. Sci. USA* 86:8932-8935 (1989); and Zijlstra et al., *Nature* 342:435-438 (1989), which are herein incorporated by reference. This method involves the activation of a gene which is present in the target cells, but which is not normally expressed in the cells, or is expressed at a lower level than desired.

Polynucleotide constructs are made, using standard techniques known in the art, which contain the promoter with targeting sequences flanking the promoter. Suitable promoters are described herein. The targeting sequence is sufficiently complementary to an endogenous sequence to permit homologous recombination of the promoter-targeting sequence with the endogenous sequence. The targeting sequence will be sufficiently near the 5' end of the desired endogenous polynucleotide sequence so the promoter will be operably linked to the endogenous sequence upon homologous recombination.

The promoter and the targeting sequences can be amplified using PCR. Preferably, the amplified promoter contains distinct restriction enzyme sites on the 5' and 3' ends. Preferably, the 3' end of the first targeting sequence contains the same restriction enzyme site as the 5' end of the amplified promoter and the 5' end of the second targeting sequence contains the same restriction site as the 3' end of the amplified promoter. The amplified promoter and targeting sequences are digested and ligated together.

The promoter-targeting sequence construct is delivered to the cells, either as naked polynucleotide, or in conjunction with transfection-facilitating agents, such as liposomes, viral



sequences, viral particles, whole viruses, lipofection, precipitating agents, etc., described in more detail above. The P promoter-targeting sequence can be delivered by any method, included direct needle injection, intravenous injection, topical administration, catheter infusion, particle accelerators, etc. The methods are described in more detail below.

5           The promoter-targeting sequence construct is taken up by cells. Homologous recombination between the construct and the endogenous sequence takes place, such that an endogenous sequence is placed under the control of the promoter. The promoter then drives the expression of the endogenous sequence.

10           The polynucleotide encoding a polypeptide of the present invention may contain a secretory signal sequence that facilitates secretion of the protein. Typically, the signal sequence is positioned in the coding region of the polynucleotide to be expressed towards or at the 5' end of the coding region. The signal sequence may be homologous or heterologous to the polynucleotide of interest and may be homologous or heterologous to the cells to be transfected. Additionally, the signal sequence may be chemically synthesized using methods known in the art.

15           Any mode of administration of any of the above-described polynucleotides constructs can be used so long as the mode results in the expression of one or more molecules in an amount sufficient to provide a therapeutic effect. This includes direct needle injection, systemic injection, catheter infusion, biolistic injectors, particle accelerators (i.e., "gene guns"), gelfoam sponge depots, other commercially available depot materials, osmotic pumps (e.g., Alza minipumps), oral  
20 or suppository solid (tablet or pill) pharmaceutical, and decanting or topical applications during surgery. For example, direct injection of naked calcium phosphate-precipitated plasmid into rat liver and rat spleen or a protein-coated plasmid into the portal vein has resulted in gene expression of the foreign gene in the rat livers (Kaneda et al., Science 243:375 (1989)).

25           A preferred method of local administration is by direct injection. Preferably, a recombinant molecule of the present invention complexed with a delivery vehicle is administered by direct injection into or locally within the area of arteries. Administration of a composition locally within the area of arteries refers to injecting the composition centimeters and preferably, millimeters within arteries.

30           Another method of local administration is to contact a polynucleotide construct of the present invention in or around a surgical wound. For example, a patient can undergo surgery and the polynucleotide construct can be coated on the surface of tissue inside the wound or the construct can be injected into areas of tissue inside the wound.

35           Therapeutic compositions useful in systemic administration include recombinant molecules of the present invention complexed to a targeted delivery vehicle of the present invention. Suitable delivery vehicles for use with systemic administration comprise liposomes comprising ligands for targeting the vehicle to a particular site. In specific embodiments, suitable

delivery vehicles for use with systemic administration comprise liposomes comprising polypeptides of the invention for targeting the vehicle to a particular site.

Preferred methods of systemic administration, include intravenous injection, aerosol, oral and percutaneous (topical) delivery. Intravenous injections can be performed using methods standard in the art. Aerosol delivery can also be performed using methods standard in the art (see, for example, Stribling et al., Proc. Natl. Acad. Sci. USA 189:11277-11281, 1992, which is incorporated herein by reference). Oral delivery can be performed by complexing a polynucleotide construct of the present invention to a carrier capable of withstanding degradation by digestive enzymes in the gut of an animal. Examples of such carriers, include plastic capsules or tablets, such as those known in the art. Topical delivery can be performed by mixing a polynucleotide construct of the present invention with a lipophilic reagent (e.g., DMSO) that is capable of passing into the skin.

Determining an effective amount of substance to be delivered can depend upon a number of factors including, for example, the chemical structure and biological activity of the substance, the age and weight of the animal, the precise condition requiring treatment and its severity, and the route of administration. The frequency of treatments depends upon a number of factors, such as the amount of polynucleotide constructs administered per dose, as well as the health and history of the subject. The precise amount, number of doses, and timing of doses will be determined by the attending physician or veterinarian.

Therapeutic compositions of the present invention can be administered to any animal, preferably to mammals and birds. Preferred mammals include humans, dogs, cats, mice, rats, rabbits sheep, cattle, horses and pigs, with humans being particularly preferred.

#### **Biological Activities**

Polynucleotides or polypeptides, or agonists or antagonists of the present invention, can be used in assays to test for one or more biological activities. If these polynucleotides or polypeptides, or agonists or antagonists of the present invention, do exhibit activity in a particular assay, it is likely that these molecules may be involved in the diseases associated with the biological activity. Thus, the polynucleotides and polypeptides, and agonists or antagonists could be used to treat the associated disease.

Members of the secreted family of proteins are believed to be involved in biological activities associated with, for example, cellular signaling. Accordingly, compositions of the invention (including polynucleotides, polypeptides and antibodies of the invention, and fragments and variants thereof) may be used in diagnosis, prognosis, prevention and/or treatment of diseases and/or disorders associated with aberrant activity of secreted polypeptides.

In preferred embodiments, compositions of the invention (including polynucleotides, polypeptides and antibodies of the invention, and fragments and variants thereof) may be used in the diagnosis, prognosis, prevention, treatment, and/or amelioration of diseases and/or disorders relating to the gastrointestinal system (e.g., Crohn's disease, pancreatitis, gallstones, antibiotic-associated colitis, duodenitis, gastrointestinal neoplasms, and as described in the "Gastrointestinal Disorders" section below).

In certain embodiments, a polypeptide of the invention, or polynucleotides, antibodies, agonists, or antagonists corresponding to that polypeptide, may be used to diagnose and/or prognosticate diseases and/or disorders associated with the tissue(s) in which the polypeptide of the invention is expressed including one, two, three, four, five, or more tissues disclosed in Table 1B.2, column 5 (Tissue Distribution Library Code).

Thus, polynucleotides, translation products and antibodies of the invention are useful in the diagnosis, detection, prevention, prognostication, and/or treatment of diseases and/or disorders associated with activities that include, but are not limited to, prohormone activation, neurotransmitter activity, cellular signaling, cellular proliferation, cellular differentiation, and cell migration.

More generally, polynucleotides, translation products and antibodies corresponding to this gene may be useful for the diagnosis, prognosis, prevention, treatment and/or amelioration of diseases and/or disorders associated with the following system or systems.

#### **Immune Activity**

Polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be useful in preventing, diagnosing, prognosticating, treating, and/or ameliorating diseases, disorders, and/or conditions of the immune system, by, for example, activating or inhibiting the proliferation, differentiation, or mobilization (chemotaxis) of immune cells. Immune cells develop through a process called hematopoiesis, producing myeloid (platelets, red blood cells, neutrophils, and macrophages) and lymphoid (B and T lymphocytes) cells from pluripotent stem cells. The etiology of these immune diseases, disorders, and/or conditions may be genetic, somatic, such as cancer and some autoimmune diseases, acquired (e.g., by chemotherapy or toxins), or infectious. Moreover, polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention can be used as a marker or detector of a particular immune system disease or disorder.

In another embodiment, a polypeptide of the invention, or polynucleotides, antibodies, agonists, or antagonists corresponding to that polypeptide, may be used to treat diseases and disorders of the immune system and/or to inhibit or enhance an immune response generated by

cells associated with the tissue(s) in which the polypeptide of the invention is expressed, including one, two, three, four, five, or more tissues disclosed in Table 1B.2, column 5 (Tissue Distribution Library Code).

Polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be useful in preventing, diagnosing, prognosticating, treating and/or ameliorating immunodeficiencies, including both congenital and acquired immunodeficiencies. Examples of B cell immunodeficiencies in which immunoglobulin levels B cell function and/or B cell numbers are decreased include: X-linked agammaglobulinemia (Bruton's disease), X-linked infantile agammaglobulinemia, X-linked immunodeficiency with hyper IgM, non X-linked immunodeficiency with hyper IgM, X-linked lymphoproliferative syndrome (XLP), agammaglobulinemia including congenital and acquired agammaglobulinemia, adult onset agammaglobulinemia, late-onset agammaglobulinemia, dysgammaglobulinemia, hypogammaglobulinemia, unspecified hypogammaglobulinemia, recessive agammaglobulinemia (Swiss type), Selective IgM deficiency, selective IgA deficiency, selective IgG subclass deficiencies, IgG subclass deficiency (with or without IgA deficiency), Ig deficiency with increased IgM, IgG and IgA deficiency with increased IgM, antibody deficiency with normal or elevated Igs, Ig heavy chain deletions, kappa chain deficiency, B cell lymphoproliferative disorder (BLPD), common variable immunodeficiency (CVID), common variable immunodeficiency (CVI) (acquired), and transient hypogammaglobulinemia of infancy.

In specific embodiments, ataxia-telangiectasia or conditions associated with ataxia-telangiectasia are detected, prevented, diagnosed, prognosticated, treated, and/or ameliorated using the polypeptides or polynucleotides of the invention, and/or agonists or antagonists thereof.

Examples of congenital immunodeficiencies in which T cell and/or B cell function and/or number is decreased include, but are not limited to: DiGeorge anomaly, severe combined immunodeficiencies (SCID) (including, but not limited to, X-linked SCID, autosomal recessive SCID, adenosine deaminase deficiency, purine nucleoside phosphorylase (PNP) deficiency, Class II MHC deficiency (Bare lymphocyte syndrome), Wiskott-Aldrich syndrome, and ataxia telangiectasia), thymic hypoplasia, third and fourth pharyngeal pouch syndrome, 22q11.2 deletion, chronic mucocutaneous candidiasis, natural killer cell deficiency (NK), idiopathic CD4+ T-lymphocytopenia, immunodeficiency with predominant T cell defect (unspecified), and unspecified immunodeficiency of cell mediated immunity.

In specific embodiments, DiGeorge anomaly or conditions associated with DiGeorge anomaly are prevented, detected, diagnosed, prognosticated, treated and/or ameliorated using polypeptides or polynucleotides of the invention, or antagonists or agonists thereof.

Other immunodeficiencies that may be prevented, detected, diagnosed, prognosticated, treated and/or ameliorated using polypeptides or polynucleotides of the invention, and/or agonists or antagonists thereof, include, but are not limited to, chronic granulomatous disease, Chédiak-Higashi syndrome, myeloperoxidase deficiency, leukocyte glucose-6-phosphate dehydrogenase deficiency, X-linked lymphoproliferative syndrome (XLP), leukocyte adhesion deficiency, complement component deficiencies (including C1, C2, C3, C4, C5, C6, C7, C8 and/or C9 deficiencies), reticular dysgenesis, thymic aplasia-aplasia, immunodeficiency with thymoma, severe congenital leukopenia, dysplasia with immunodeficiency, neonatal neutropenia, short limbed dwarfism, and Nezelof syndrome-combined immunodeficiency with Igs.

In a preferred embodiment, the immunodeficiencies and/or conditions associated with the immunodeficiencies recited above are prevented, detected, diagnosed, prognosticated, treated and/or ameliorated using polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention.

In a preferred embodiment polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention could be used as an agent to boost immunoresponsiveness among immunodeficient individuals. In specific embodiments, polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention could be used as an agent to boost immunoresponsiveness among B cell and/or T cell immunodeficient individuals.

The polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be useful in preventing, detecting, diagnosing, prognosticating, treating and/or ameliorating autoimmune disorders. Many autoimmune disorders result from inappropriate recognition of self as foreign material by immune cells. This inappropriate recognition results in an immune response leading to the destruction of the host tissue. Therefore, the administration of polynucleotides and polypeptides of the invention that can inhibit an immune response, particularly the proliferation, differentiation, or chemotaxis of T-cells, may be an effective therapy in preventing autoimmune disorders.

Autoimmune diseases or disorders that may be prevented, detected, diagnosed, prognosticated, treated, and/or ameliorated by polynucleotides, polypeptides, antibodies, and/or

agonists or antagonists of the present invention include, but are not limited to, one or more of the following: systemic lupus erythematosus, rheumatoid arthritis, ankylosing spondylitis, multiple sclerosis, autoimmune thyroiditis, Hashimoto's thyroiditis, autoimmune hemolytic anemia, hemolytic anemia, thrombocytopenia, autoimmune thrombocytopenia purpura, autoimmune  
5 neonatal thrombocytopenia, idiopathic thrombocytopenia purpura, purpura (e.g., Henoch-Schoenlein purpura), autoimmune cytopenia, Goodpasture's syndrome, Pemphigus vulgaris, myasthenia gravis, Grave's disease (hyperthyroidism), and insulin-resistant diabetes mellitus.

Additional disorders that are likely to have an autoimmune component that may be prevented, detected, diagnosed, prognosticated, treated and/or ameliorated with the compositions  
10 of the invention include, but are not limited to, type II collagen-induced arthritis, antiphospholipid syndrome, dermatitis, allergic encephalomyelitis, myocarditis, relapsing polychondritis, rheumatic heart disease, neuritis, uveitis ophthalmia, polyendocrinopathies, Reiter's Disease, Stiff-Man Syndrome, autoimmune pulmonary inflammation, autism, Guillain-Barre Syndrome, insulin dependent diabetes mellitus, and autoimmune inflammatory eye disorders.

15 Additional disorders that are likely to have an autoimmune component that may be prevented, detected, diagnosed, prognosticated, treated and/or ameliorated with the compositions of the invention include, but are not limited to, scleroderma with anti-collagen antibodies (often characterized, e.g., by nucleolar and other nuclear antibodies), mixed connective tissue disease (often characterized, e.g., by antibodies to extractable nuclear antigens (e.g., ribonucleoprotein)),  
20 polymyositis (often characterized, e.g., by nonhistone ANA), pernicious anemia (often characterized, e.g., by antiparietal cell, microsomes, and intrinsic factor antibodies), idiopathic Addison's disease (often characterized, e.g., by humoral and cell-mediated adrenal cytotoxicity, infertility (often characterized, e.g., by antispermatozoal antibodies), glomerulonephritis (often characterized, e.g., by glomerular basement membrane antibodies or immune complexes), bullous  
25 pemphigoid (often characterized, e.g., by IgG and complement in basement membrane), Sjogren's syndrome (often characterized, e.g., by multiple tissue antibodies, and/or a specific nonhistone ANA (SS-B)), diabetes mellitus (often characterized, e.g., by cell-mediated and humoral islet cell antibodies), and adrenergic drug resistance (including adrenergic drug resistance with asthma or cystic fibrosis) (often characterized, e.g., by beta-adrenergic receptor antibodies).

30 Additional disorders that may have an autoimmune component that may be prevented, detected, diagnosed, prognosticated, treated and/or ameliorated with the compositions of the

invention include, but are not limited to, chronic active hepatitis (often characterized, e.g., by smooth muscle antibodies), primary biliary cirrhosis (often characterized, e.g., by mitochondria antibodies), other endocrine gland failure (often characterized, e.g., by specific tissue antibodies in some cases), vitiligo (often characterized, e.g., by melanocyte antibodies), vasculitis (often  
5 characterized, e.g., by Ig and complement in vessel walls and/or low serum complement), post-MI (often characterized, e.g., by myocardial antibodies), cardiomy syndrome (often characterized, e.g., by myocardial antibodies), urticaria (often characterized, e.g., by IgG and IgM antibodies to IgE), atopic dermatitis (often characterized, e.g., by IgG and IgM antibodies to IgE), asthma (often characterized, e.g., by IgG and IgM antibodies to IgE), and many other inflammatory,  
10 granulomatous, degenerative, and atrophic disorders.

In a preferred embodiment, the autoimmune diseases and disorders and/or conditions associated with the diseases and disorders recited above are prevented, detected, diagnosed, prognosticated, treated and/or ameliorated using for example, antagonists or agonists, polypeptides or polynucleotides, or antibodies of the present invention. In a specific preferred embodiment,  
15 rheumatoid arthritis is prevented, detected, diagnosed, prognosticated, treated and/or ameliorated using polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention.

In another specific preferred embodiment, systemic lupus erythematosus is prevented, detected, diagnosed, prognosticated, treated and/or ameliorated using polynucleotides,  
20 polypeptides, antibodies, and/or agonists or antagonists of the present invention. In another specific preferred embodiment, idiopathic thrombocytopenia purpura is prevented, detected, diagnosed, prognosticated, treated and/or ameliorated using polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention.

In another specific preferred embodiment IgA nephropathy is prevented, detected,  
25 diagnosed, prognosticated, treated and/or ameliorated using polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention.

In a preferred embodiment, the autoimmune diseases and disorders and/or conditions associated with the diseases and disorders recited above are prevented, detected, diagnosed, prognosticated, treated and/or ameliorated using polynucleotides, polypeptides, antibodies, and/or  
30 agonists or antagonists of the present invention

In preferred embodiments, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are used as a immunosuppressive agent(s).

Polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be useful in detecting, preventing, diagnosing, prognosticating, treating, and/or ameliorating diseases, disorders, and/or conditions of hematopoietic cells. Polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention could be used to increase differentiation and proliferation of hematopoietic cells, including the pluripotent stem cells, in an effort to treat or prevent those diseases, disorders, and/or conditions associated with a decrease in certain (or many) types hematopoietic cells, including but not limited to, leukopenia, neutropenia, anemia, and thrombocytopenia. Alternatively, Polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention could be used to increase differentiation and proliferation of hematopoietic cells, including the pluripotent stem cells, in an effort to treat or prevent those diseases, disorders, and/or conditions associated with an increase in certain (or many) types of hematopoietic cells, including but not limited to, histiocytosis.

Allergic reactions and conditions, such as asthma (particularly allergic asthma) or other respiratory problems, may also be detected, prevented, diagnosed, prognosticated, treated, and/or ameliorated using polypeptides, antibodies, or polynucleotides of the invention, and/or agonists or antagonists thereof. Moreover, these molecules can be used to treat, prevent, prognose, and/or diagnose anaphylaxis, hypersensitivity to an antigenic molecule, or blood group incompatibility.

Additionally, polypeptides or polynucleotides of the invention, and/or agonists or antagonists thereof, may be used to detect, prevent, diagnose, prognosticate, treat, and/or ameliorate IgE-mediated allergic reactions. Such allergic reactions include, but are not limited to, asthma, rhinitis, and eczema. In specific embodiments, polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be used to modulate IgE concentrations in vitro or in vivo.

Moreover, polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention have uses in the detection, prevention, diagnosis, prognostication, treatment, and/or amelioration of inflammatory conditions. For example, since polypeptides, antibodies, or polynucleotides of the invention, and/or agonists or antagonists of the invention may inhibit the activation, proliferation and/or differentiation of cells involved in an inflammatory response, these



molecules can be used to prevent and/or treat chronic and acute inflammatory conditions. Such inflammatory conditions include, but are not limited to, for example, inflammation associated with infection (e.g., septic shock, sepsis, or systemic inflammatory response syndrome), ischemia-reperfusion injury, endotoxin lethality, complement-mediated hyperacute rejection, nephritis, cytokine or chemokine induced lung injury, inflammatory bowel disease, Crohn's disease, over  
5 production of cytokines (e.g., TNF or IL-1.), respiratory disorders (e.g., asthma and allergy); gastrointestinal disorders (e.g., inflammatory bowel disease); cancers (e.g., gastric, ovarian, lung, bladder, liver, and breast); CNS disorders (e.g., multiple sclerosis; ischemic brain injury and/or stroke, traumatic brain injury, neurodegenerative disorders (e.g., Parkinson's disease and  
10 Alzheimer's disease); AIDS-related dementia; and prion disease); cardiovascular disorders (e.g., atherosclerosis, myocarditis, cardiovascular disease, and cardiopulmonary bypass complications); as well as many additional diseases, conditions, and disorders that are characterized by inflammation (e.g., hepatitis, rheumatoid arthritis, gout, trauma, pancreatitis, sarcoidosis, dermatitis, renal ischemia-reperfusion injury, Grave's disease, systemic lupus erythematosus,  
15 diabetes mellitus, and allogenic transplant rejection).

Because inflammation is a fundamental defense mechanism, inflammatory disorders can effect virtually any tissue of the body. Accordingly, polynucleotides, polypeptides, and antibodies of the invention, as well as agonists or antagonists thereof, have uses in the treatment of tissue-specific inflammatory disorders, including, but not limited to, adenitis, alveolitis,  
20 angiocholecystitis, appendicitis, balanitis, blepharitis, bronchitis, bursitis, carditis, cellulitis, cervicitis, cholecystitis, chorditis, cochlitis, colitis, conjunctivitis, cystitis, dermatitis, diverticulitis, encephalitis, endocarditis, esophagitis, eustachitis, fibrositis, folliculitis, gastritis, gastroenteritis, gingivitis, glossitis, hepatosplenitis, keratitis, labyrinthitis, laryngitis, lymphangitis, mastitis, media otitis, meningitis, metritis, mucitis, myocarditis, myositis, myringitis, nephritis, neuritis,  
25 orchitis, osteochondritis, otitis, pericarditis, peritendonitis, peritonitis, pharyngitis, phlebitis, poliomyelitis, prostatitis, pulpitis, retinitis, rhinitis, salpingitis, scleritis, sclerochoroiditis, scrotitis, sinusitis, spondylitis, steatitis, stomatitis, synovitis, syringitis, tendonitis, tonsillitis, urethritis, and vaginitis.

In specific embodiments, polypeptides, antibodies, or polynucleotides of the  
30 invention, and/or agonists or antagonists thereof, are useful to detect, prevent, diagnose, prognosticate, treat, and/or ameliorate organ transplant rejections and graft-versus-host disease.

Organ rejection occurs by host immune cell destruction of the transplanted tissue through an immune response. Similarly, an immune response is also involved in GVHD, but, in this case, the foreign transplanted immune cells destroy the host tissues. Polypeptides, antibodies, or polynucleotides of the invention, and/or agonists or antagonists thereof, that inhibit an immune response, particularly the activation, proliferation, differentiation, or chemotaxis of T-cells, may be an effective therapy in preventing organ rejection or GVHD. In specific embodiments, polypeptides, antibodies, or polynucleotides of the invention, and/or agonists or antagonists thereof, that inhibit an immune response, particularly the activation, proliferation, differentiation, or chemotaxis of T-cells, may be an effective therapy in preventing experimental allergic and hyperacute xenograft rejection.

In other embodiments, polypeptides, antibodies, or polynucleotides of the invention, and/or agonists or antagonists thereof, are useful to detect, prevent, diagnose, prognosticate, treat, and/or ameliorate immune complex diseases, including, but not limited to, serum sickness, post streptococcal glomerulonephritis, polyarteritis nodosa, and immune complex-induced vasculitis.

Polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the invention can be used to treat, detect, and/or prevent infectious agents. For example, by increasing the immune response, particularly increasing the proliferation activation and/or differentiation of B and/or T cells, infectious diseases may be treated, detected, and/or prevented. The immune response may be increased by either enhancing an existing immune response, or by initiating a new immune response. Alternatively, polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may also directly inhibit the infectious agent (refer to section of application listing infectious agents, etc), without necessarily eliciting an immune response.

In another embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are used as a vaccine adjuvant that enhances immune responsiveness to an antigen. In a specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are used as an adjuvant to enhance tumor-specific immune responses.

In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are used as an adjuvant to enhance anti-viral immune responses. Anti-viral immune responses that may be enhanced using the compositions of

the invention as an adjuvant, include virus and virus associated diseases or symptoms described herein or otherwise known in the art. In specific embodiments, the compositions of the invention are used as an adjuvant to enhance an immune response to a virus, disease, or symptom selected from the group consisting of: AIDS, meningitis, Dengue, EBV, and hepatitis (e.g., hepatitis B). In  
5 another specific embodiment, the compositions of the invention are used as an adjuvant to enhance an immune response to a virus, disease, or symptom selected from the group consisting of: HIV/AIDS, respiratory syncytial virus, Dengue, rotavirus, Japanese B encephalitis, influenza A and B, parainfluenza, measles, cytomegalovirus, rabies, Junin, Chikungunya, Rift Valley Fever, herpes simplex, and yellow fever.

10 In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are used as an adjuvant to enhance anti-bacterial or anti-fungal immune responses. Anti-bacterial or anti-fungal immune responses that may be enhanced using the compositions of the invention as an adjuvant, include bacteria or fungus and bacteria or fungus associated diseases or symptoms described herein or otherwise known in the art.  
15 In specific embodiments, the compositions of the invention are used as an adjuvant to enhance an immune response to a bacteria or fungus, disease, or symptom selected from the group consisting of: tetanus, Diphtheria, botulism, and meningitis type B.

In another specific embodiment, the compositions of the invention are used as an adjuvant to enhance an immune response to a bacteria or fungus, disease, or symptom selected  
20 from the group consisting of: *Vibrio cholerae*, *Mycobacterium leprae*, *Salmonella typhi*, *Salmonella paratyphi*, *Meisseria meningitidis*, *Streptococcus pneumoniae*, Group B streptococcus, *Shigella spp.*, Enterotoxigenic *Escherichia coli*, Enterohemorrhagic *E. coli*, and *Borrelia burgdorferi*.

In another specific embodiment, polypeptides, antibodies, polynucleotides and/or  
25 agonists or antagonists of the present invention are used as an adjuvant to enhance anti-parasitic immune responses. Anti-parasitic immune responses that may be enhanced using the compositions of the invention as an adjuvant, include parasite and parasite associated diseases or symptoms described herein or otherwise known in the art. In specific embodiments, the compositions of the invention are used as an adjuvant to enhance an immune response to a parasite. In another specific  
30 embodiment, the compositions of the invention are used as an adjuvant to enhance an immune response to Plasmodium (malaria) or Leishmania.

In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention may also be employed to treat infectious diseases including silicosis, sarcoidosis, and idiopathic pulmonary fibrosis; for example, by preventing the recruitment and activation of mononuclear phagocytes.

- 5           In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are used as an antigen for the generation of antibodies to inhibit or enhance immune mediated responses against polypeptides of the invention.

- 10           In one embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are administered to an animal (e.g., mouse, rat, rabbit, hamster, guinea pig, pigs, micro-pig, chicken, camel, goat, horse, cow, sheep, dog, cat, non-human primate, and human, most preferably human) to boost the immune system to produce increased quantities of one or more antibodies (e.g., IgG, IgA, IgM, and IgE), to induce higher affinity antibody production and immunoglobulin class switching (e.g., IgG, IgA, IgM, and IgE), and/or to increase an immune response.

- 15           In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are used as a stimulator of B cell responsiveness to pathogens.

In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are used as an activator of T cells.

- 20           In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are used as an agent that elevates the immune status of an individual prior to their receipt of immunosuppressive therapies.

- 25           In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are used as an agent to induce higher affinity antibodies.

In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are used as an agent to increase serum immunoglobulin concentrations.

- 30           In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are used as an agent to accelerate recovery of immunocompromised individuals.

In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are used as an agent to boost immunoresponsiveness among aged populations and/or neonates.

5 In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are used as an immune system enhancer prior to, during, or after bone marrow transplant and/or other transplants (e.g., allogeneic or xenogeneic organ transplantation). With respect to transplantation, compositions of the invention may be administered prior to, concomitant with, and/or after transplantation. In a specific embodiment, compositions of the invention are administered after transplantation, prior to the beginning of  
10 recovery of T-cell populations. In another specific embodiment, compositions of the invention are first administered after transplantation after the beginning of recovery of T cell populations, but prior to full recovery of B cell populations.

In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are used as an agent to boost  
15 immunoresponsiveness among individuals having an acquired loss of B cell function. Conditions resulting in an acquired loss of B cell function that may be ameliorated or treated by administering the polypeptides, antibodies, polynucleotides and/or agonists or antagonists thereof, include, but are not limited to, HIV Infection, AIDS, bone marrow transplant, and B cell chronic lymphocytic leukemia (CLL).

20 In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are used as an agent to boost immunoresponsiveness among individuals having a temporary immune deficiency. Conditions resulting in a temporary immune deficiency that may be ameliorated or treated by administering the polypeptides, antibodies, polynucleotides and/or agonists or antagonists thereof, include, but  
25 are not limited to, recovery from viral infections (e.g., influenza), conditions associated with malnutrition, recovery from infectious mononucleosis, or conditions associated with stress, recovery from measles, recovery from blood transfusion, and recovery from surgery.

In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are used as a regulator of antigen presentation by  
30 monocytes, dendritic cells, and/or B-cells. In one embodiment, polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention enhance antigen presentation or

antagonizes antigen presentation in vitro or in vivo. Moreover, in related embodiments, said enhancement or antagonism of antigen presentation may be useful as an anti-tumor treatment or to modulate the immune system.

5 In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are used as an agent to direct an individual's immune system towards development of a humoral response (i.e. TH2) as opposed to a TH1 cellular response.

10 In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are used as a means to induce tumor proliferation and thus make it more susceptible to anti-neoplastic agents. For example, multiple myeloma is a slowly dividing disease and is thus refractory to virtually all anti-neoplastic regimens. If these cells were forced to proliferate more rapidly their susceptibility profile would likely change.

15 In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are used as a stimulator of B cell production in pathologies such as AIDS, chronic lymphocyte disorder and/or Common Variable Immunodeficiency.

20 In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are used as a therapy for generation and/or regeneration of lymphoid tissues following surgery, trauma or genetic defect. In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are used in the pretreatment of bone marrow samples prior to transplant.

25 In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are used as a gene-based therapy for genetically inherited disorders resulting in immuno-incompetence/immunodeficiency such as observed among SCID patients.

In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are used as a means of activating monocytes/macrophages to defend against parasitic diseases that effect monocytes such as Leishmania.

In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are used as a means of regulating secreted cytokines that are elicited by polypeptides of the invention.

5 In another embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are used in one or more of the applications described herein, as they may apply to veterinary medicine.

In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are used as a means of blocking various aspects of immune responses to foreign agents or self. Examples of diseases or conditions in which blocking  
10 of certain aspects of immune responses may be desired include autoimmune disorders such as lupus, and arthritis, as well as immunoresponsiveness to skin allergies, inflammation, bowel disease, injury and diseases/disorders associated with pathogens.

In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are used as a therapy for preventing the B cell  
15 proliferation and Ig secretion associated with autoimmune diseases such as idiopathic thrombocytopenic purpura, systemic lupus erythematosus and multiple sclerosis.

In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are used as a inhibitor of B and/or T cell migration in endothelial cells. This activity disrupts tissue architecture or cognate responses and is useful,  
20 for example in disrupting immune responses, and blocking sepsis.

In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are used as a therapy for chronic hypergammaglobulinemia evident in such diseases as monoclonal gammopathy of undetermined significance (MGUS), Waldenstrom's disease, related idiopathic monoclonal gammopathies, and  
25 plasmacytomas.

In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention may be employed for instance to inhibit polypeptide chemotaxis and activation of macrophages and their precursors, and of neutrophils, basophils, B lymphocytes and some T-cell subsets, e.g., activated and CD8 cytotoxic T cells and  
30 natural killer cells, in certain autoimmune and chronic inflammatory and infective diseases.

Examples of autoimmune diseases are described herein and include multiple sclerosis, and insulin-dependent diabetes.

The polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention may also be employed to treat idiopathic hyper-eosinophilic syndrome by, for  
5 example, preventing eosinophil production and migration.

In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are used to enhance or inhibit complement mediated cell lysis.

In another specific embodiment, polypeptides, antibodies, polynucleotides and/or  
10 agonists or antagonists of the present invention are used to enhance or inhibit antibody dependent cellular cytotoxicity.

In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention may also be employed for treating atherosclerosis, for example, by preventing monocyte infiltration in the artery wall.

15 In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention may be employed to treat adult respiratory distress syndrome (ARDS).

In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention may be useful for stimulating wound and tissue  
20 repair, stimulating angiogenesis, and/or stimulating the repair of vascular or lymphatic diseases or disorders. Additionally, agonists and antagonists of the invention may be used to stimulate the regeneration of mucosal surfaces.

In a specific embodiment, polynucleotides or polypeptides, and/or agonists thereof are used to detect, prevent, diagnose, prognosticate, treat, and/or ameliorate a disorder characterized  
25 by primary or acquired immunodeficiency, deficient serum immunoglobulin production, recurrent infections, and/or immune system dysfunction. Moreover, polynucleotides or polypeptides, and/or agonists thereof may be used to treat or prevent infections of the joints, bones, skin, and/or parotid glands, blood-borne infections (e.g., sepsis, meningitis, septic arthritis, and/or osteomyelitis), autoimmune diseases (e.g., those disclosed herein), inflammatory disorders, and malignancies,  
30 and/or any disease or disorder or condition associated with these infections, diseases, disorders and/or malignancies) including, but not limited to, CVID, other primary immune deficiencies,



HIV disease, CLL, recurrent bronchitis, sinusitis, otitis media, conjunctivitis, pneumonia, hepatitis, meningitis, herpes zoster (e.g., severe herpes zoster), and/or pneumocystis carinii. Other diseases and disorders that may be detected, prevented, diagnosed, prognosticated, treated, and/or ameliorated with polynucleotides or polypeptides, and/or agonists of the present invention include, but are not limited to, HIV infection, HTLV-BLV infection, lymphopenia, phagocyte bactericidal dysfunction anemia, thrombocytopenia, and hemoglobinuria.

In another embodiment, polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention are used to treat, and/or diagnose an individual having common variable immunodeficiency disease ("CVID"; also known as "acquired agammaglobulinemia" and "acquired hypogammaglobulinemia") or a subset of this disease.

In a specific embodiment, polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be used to detect, prevent, diagnose, prognosticate, treat, and/or ameliorate cancers or neoplasms including immune cell or immune tissue-related cancers or neoplasms. Examples of cancers or neoplasms that may be detected, prevented, diagnosed, prognosticated, treated, and/or ameliorated by polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention include, but are not limited to, acute myelogenous leukemia, chronic myelogenous leukemia, Hodgkin's disease, non-Hodgkin's lymphoma, acute lymphocytic leukemia (ALL) Chronic lymphocyte leukemia, plasmacytomas, multiple myeloma, Burkitt's lymphoma, EBV-transformed diseases, and/or diseases and disorders described in the section entitled "Hyperproliferative Disorders" elsewhere herein.

In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are used as a therapy for decreasing cellular proliferation of Large B-cell Lymphomas.

In another specific embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are used as a means of decreasing the involvement of B cells and Ig associated with Chronic Myelogenous Leukemia.

In specific embodiments, the compositions of the invention are used as an agent to boost immunoresponsiveness among B cell immunodeficient individuals, such as, for example, an individual who has undergone a partial or complete splenectomy.

Antagonists of the invention include, for example, binding and/or inhibitory antibodies, antisense nucleic acids, ribozymes or soluble forms of the polypeptides of the present

invention (e.g., Fc fusion protein; see, e.g., Example 9). Agonists of the invention include, for example, binding or stimulatory antibodies, and soluble forms of the polypeptides (e.g., Fc fusion proteins; see, e.g., Example 9). polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention may be employed in a composition with a pharmaceutically acceptable carrier, e.g., as described herein.

In another embodiment, polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention are administered to an animal (including, but not limited to, those listed above, and also including transgenic animals) incapable of producing functional endogenous antibody molecules or having an otherwise compromised endogenous immune system, but which is capable of producing human immunoglobulin molecules by means of a reconstituted or partially reconstituted immune system from another animal (see, e.g., published PCT Application Nos. WO98/24893, WO/9634096, WO/9633735, and WO/9110741). Administration of polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention to such animals is useful for the generation of monoclonal antibodies against the polypeptides, antibodies, polynucleotides and/or agonists or antagonists of the present invention.

#### **Blood-Related Disorders**

The polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be used to modulate hemostatic (the stopping of bleeding) or thrombolytic (clot dissolving) activity. For example, by increasing hemostatic or thrombolytic activity, polynucleotides or polypeptides, and/or agonists or antagonists of the present invention could be used to treat or prevent blood coagulation diseases, disorders, and/or conditions (e.g., afibrinogenemia, factor deficiencies, hemophilia), blood platelet diseases, disorders, and/or conditions (e.g., thrombocytopenia), or wounds resulting from trauma, surgery, or other causes. Alternatively, polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention that can decrease hemostatic or thrombolytic activity could be used to inhibit or dissolve clotting. These molecules could be important in the treatment or prevention of heart attacks (infarction), strokes, or scarring.

In specific embodiments, the polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be used to detect, prevent, diagnose, prognosticate, treat, and/or ameliorate thrombosis, arterial thrombosis, venous thrombosis, thromboembolism, pulmonary embolism, atherosclerosis, myocardial infarction, transient ischemic attack, unstable angina. In specific embodiments, the polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be used for the prevention

of occlusion of saphenous grafts, for reducing the risk of periprocedural thrombosis as might accompany angioplasty procedures, for reducing the risk of stroke in patients with atrial fibrillation including nonrheumatic atrial fibrillation, for reducing the risk of embolism associated with mechanical heart valves and or mitral valves disease. Other uses for the polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention, include, but are not limited to, the prevention of occlusions in extracorporeal devices (e.g., intravascular canulas, vascular access shunts in hemodialysis patients, hemodialysis machines, and cardiopulmonary bypass machines).

In another embodiment, a polypeptide of the invention, or polynucleotides, antibodies, agonists, or antagonists corresponding to that polypeptide, may be used to detect, prevent, diagnose, prognosticate, treat, and/or ameliorate diseases and disorders of the blood and/or blood forming organs associated with the tissue(s) in which the polypeptide of the invention is expressed, including one, two, three, four, five, or more tissues disclosed in Table 1B.2, column 5 (Tissue Distribution Library Code).

The polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be used to modulate hematopoietic activity (the formation of blood cells). For example, the polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be used to increase the quantity of all or subsets of blood cells, such as, for example, erythrocytes, lymphocytes (B or T cells), myeloid cells (e.g., basophils, eosinophils, neutrophils, mast cells, macrophages) and platelets. The ability to decrease the quantity of blood cells or subsets of blood cells may be useful in the detection, prevention, diagnosis, prognostication, treatment, and/or amelioration of anemias and leukopenias described below. Alternatively, the polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be used to decrease the quantity of all or subsets of blood cells, such as, for example, erythrocytes, lymphocytes (B or T cells), myeloid cells (e.g., basophils, eosinophils, neutrophils, mast cells, macrophages) and platelets. The ability to decrease the quantity of blood cells or subsets of blood cells may be useful in the detection, prevention, diagnosis, prognostication, treatment, and/or amelioration of leukocytoses, such as, for example eosinophilia.

The polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be used to detect, prevent, diagnose, prognosticate, treat, and/or ameliorate blood dyscrasia.

Anemias are conditions in which the number of red blood cells or amount of hemoglobin (the protein that carries oxygen) in them is below normal. Anemia may be caused by excessive bleeding, decreased red blood cell production, or increased red blood cell destruction (hemolysis). The polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be useful in detecting, preventing, diagnosing, prognosticating, treating,

and/or ameliorating anemias. Anemias that may be treated detect, prevented, diagnosed, prognosticated, treated, and/or ameliorated by the polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention include iron deficiency anemia, hypochromic anemia, microcytic anemia, chlorosis, hereditary sideroblastic anemia, idiopathic acquired sideroblastic anemia, red cell aplasia, megaloblastic anemia (e.g., pernicious anemia, (vitamin B12 deficiency) and folic acid deficiency anemia), aplastic anemia, hemolytic anemias (e.g., autoimmune hemolytic anemia, microangiopathic hemolytic anemia, and paroxysmal nocturnal hemoglobinuria). The polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be useful in detecting, preventing, diagnosing, prognosticating, treating, and/or ameliorating anemias associated with diseases including but not limited to, anemias associated with systemic lupus erythematosus, cancers, lymphomas, chronic renal disease, and enlarged spleens. The polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be useful in detecting, preventing, diagnosing, prognosticating, treating, and/or ameliorating anemias arising from drug treatments such as anemias associated with methyl dopa, dapsone, and/or sulfadruugs. Additionally, the polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be useful in detecting, preventing, diagnosing, prognosticating, treating, and/or ameliorating anemias associated with abnormal red blood cell architecture including but not limited to, hereditary spherocytosis, hereditary elliptocytosis, glucose-6-phosphate dehydrogenase deficiency, and sickle cell anemia.

The polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be useful in detecting, preventing, diagnosing, prognosticating, treating, and/or ameliorating hemoglobin abnormalities, (e.g., those associated with sickle cell anemia, hemoglobin C disease, hemoglobin S-C disease, and hemoglobin E disease). Additionally, the polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be useful in detecting, preventing, diagnosing, prognosticating, treating, and/or ameliorating thalassemias, including, but not limited to major and minor forms of alpha-thalassemia and beta-thalassemia.

In another embodiment, the polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be useful in detecting, preventing, diagnosing, prognosticating, treating, and/or ameliorating bleeding disorders including, but not limited to, thrombocytopenia (e.g., idiopathic thrombocytopenic purpura, and thrombotic thrombocytopenic purpura), Von Willebrand's disease, hereditary platelet disorders (e.g., storage pool disease such as Chediak-Higashi and Hermansky-Pudlak syndromes, thromboxane A2 dysfunction, thromboasthenia, and Bernard-Soulier syndrome), hemolytic-uremic syndrome, hemophelias such as hemophilia A or Factor VII deficiency and Christmas disease or Factor IX deficiency,

Hereditary Hemorrhagic Telangiectasia, also known as Rendu-Osler-Weber syndrome, allergic purpura (Henoch Schonlein purpura) and disseminated intravascular coagulation.

The effect of the polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention on the clotting time of blood may be monitored using any of the clotting tests known in the art including, but not limited to, whole blood partial thromboplastin time (PTT), the activated partial thromboplastin time (aPTT), the activated clotting time (ACT), the recalcified activated clotting time, or the Lee-White Clotting time.

Several diseases and a variety of drugs can cause platelet dysfunction. Thus, in a specific embodiment, the polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be useful in detecting, preventing, diagnosing, prognosticating, treating, and/or ameliorating acquired platelet dysfunction such as platelet dysfunction accompanying kidney failure, leukemia, multiple myeloma, cirrhosis of the liver, and systemic lupus erythematosus as well as platelet dysfunction associated with drug treatments, including treatment with aspirin, ticlopidine, nonsteroidal anti-inflammatory drugs (used for arthritis, pain, and sprains), and penicillin in high doses.

In another embodiment, the polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be useful in detecting, preventing, diagnosing, prognosticating, treating, and/or ameliorating diseases and disorders characterized by or associated with increased or decreased numbers of white blood cells. Leukopenia occurs when the number of white blood cells decreases below normal. Leukopenias include, but are not limited to, neutropenia and lymphocytopenia. An increase in the number of white blood cells compared to normal is known as leukocytosis. The body generates increased numbers of white blood cells during infection. Thus, leukocytosis may simply be a normal physiological parameter that reflects infection. Alternatively, leukocytosis may be an indicator of injury or other disease such as cancer. Leukocytoses, include but are not limited to, eosinophilia, and accumulations of macrophages. In specific embodiments, the polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be useful in detecting, preventing, diagnosing, prognosticating, treating, and/or ameliorating leukopenia. In other specific embodiments, the polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be useful in detecting, preventing, diagnosing, prognosticating, treating, and/or ameliorating leukocytosis.

Leukopenia may be a generalized decreased in all types of white blood cells, or may be a specific depletion of particular types of white blood cells. Thus, in specific embodiments, the polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be useful in detecting, preventing, diagnosing, prognosticating, treating, and/or ameliorating decreases in neutrophil numbers, known as neutropenia. Neutropenias that may be detected,

prevented, diagnosed, prognosticated, treated, and/or ameliorated by the polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention include, but are not limited to, infantile genetic agranulocytosis, familial neutropenia, cyclic neutropenia, neutropenias resulting from or associated with dietary deficiencies (e.g., vitamin B 12 deficiency or folic acid deficiency), neutropenias resulting from or associated with drug treatments (e.g., antibiotic regimens such as penicillin treatment, sulfonamide treatment, anticoagulant treatment, anticonvulsant drugs, anti-thyroid drugs, and cancer chemotherapy), and neutropenias resulting from increased neutrophil destruction that may occur in association with some bacterial or viral infections, allergic disorders, autoimmune diseases, conditions in which an individual has an enlarged spleen (e.g., Felty syndrome, malaria and sarcoidosis), and some drug treatment regimens.

The polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be useful in detecting, preventing, diagnosing, prognosticating, treating, and/or ameliorating lymphocytopenias (decreased numbers of B and/or T lymphocytes), including, but not limited lymphocytopenias resulting from or associated with stress, drug treatments (e.g., drug treatment with corticosteroids, cancer chemotherapies, and/or radiation therapies), AIDS infection and/or other diseases such as, for example, cancer, rheumatoid arthritis, systemic lupus erythematosus, chronic infections, some viral infections and/or hereditary disorders (e.g., DiGeorge syndrome, Wiskott-Aldrich Syndrome, severe combined immunodeficiency, ataxia telangiectasia).

The polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be useful in detecting, preventing, diagnosing, prognosticating, treating, and/or ameliorating diseases and disorders associated with macrophage numbers and/or macrophage function including, but not limited to, Gaucher's disease, Niemann-Pick disease, Letterer-Siwe disease and Hand-Schuller-Christian disease.

In another embodiment, the polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be useful in detecting, preventing, diagnosing, prognosticating, treating, and/or ameliorating diseases and disorders associated with eosinophil numbers and/or eosinophil function including, but not limited to, idiopathic hypereosinophilic syndrome, eosinophilia-myalgia syndrome, and Hand-Schuller-Christian disease.

In yet another embodiment, the polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be useful in detecting, preventing, diagnosing, prognosticating, treating, and/or ameliorating leukemias and lymphomas including, but not limited to, acute lymphocytic (lymphoblastic) leukemia (ALL), acute myeloid (myelocytic, myelogenous, myeloblastic, or myelomonocytic) leukemia, chronic lymphocytic leukemia (e.g., B cell leukemias, T cell leukemias, Sezary syndrome, and Hairy cell leukemia), chronic myelocytic

(myeloid, myelogenous, or granulocytic) leukemia, Hodgkin's lymphoma, non-hodgkin's lymphoma, Burkitt's lymphoma, and mycosis fungoides.

5 In other embodiments, the polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be useful in detecting, preventing, diagnosing, prognosticating, treating, and/or ameliorating diseases and disorders of plasma cells including, but not limited to, plasma cell dyscrasias, monoclonal gammaopathies, monoclonal gammopathies of undetermined significance, multiple myeloma, macroglobulinemia, Waldenstrom's macroglobulinemia, cryoglobulinemia, and Raynaud's phenomenon.

10 In other embodiments, the polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be useful in detecting, preventing, diagnosing, prognosticating, treating, and/or ameliorating myeloproliferative disorders, including but not limited to, polycythemia vera, relative polycythemia, secondary polycythemia, myelofibrosis, acute myelofibrosis, agnogenic myelod metaplasia, thrombocythemia, (including both primary and secondary thrombocythemia) and chronic myelocytic leukemia.

15 In other embodiments, the polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be useful as a treatment prior to surgery, to increase blood cell production.

20 In other embodiments, the polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be useful as an agent to enhance the migration, phagocytosis, superoxide production, antibody dependent cellular cytotoxicity of neutrophils, eosinophils and macrophages.

25 In other embodiments, the polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be useful as an agent to increase the number of stem cells in circulation prior to stem cells pheresis. In another specific embodiment, the polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be useful as an agent to increase the number of stem cells in circulation prior to platelet pheresis.

30 In other embodiments, the polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be useful as an agent to increase cytokine production.

In other embodiments, the polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be useful in detecting, preventing, diagnosing, prognosticating, treating, and/or ameliorating primary hematopoietic disorders.

#### **Hyperproliferative Disorders**

35 In certain embodiments, polynucleotides or polypeptides, or agonists or antagonists of the present invention can be used to treat or detect hyperproliferative disorders, including neoplasms. Polynucleotides or polypeptides, or agonists or antagonists of the present invention

may inhibit the proliferation of the disorder through direct or indirect interactions. Alternatively, Polynucleotides or polypeptides, or agonists or antagonists of the present invention may proliferate other cells which can inhibit the hyperproliferative disorder.

For example, by increasing an immune response, particularly increasing antigenic  
5 qualities of the hyperproliferative disorder or by proliferating, differentiating, or mobilizing T-cells, hyperproliferative disorders can be treated. This immune response may be increased by either enhancing an existing immune response, or by initiating a new immune response. Alternatively, decreasing an immune response may also be a method of treating hyperproliferative disorders, such as a chemotherapeutic agent.

10 Examples of hyperproliferative disorders that can be treated or detected by polynucleotides or polypeptides, or agonists or antagonists of the present invention include, but are not limited to neoplasms located in the: colon, abdomen, bone, breast, digestive system, liver, pancreas, peritoneum, endocrine glands (adrenal, parathyroid, pituitary, testicles, ovary, thymus, thyroid), eye, head and neck, nervous (central and peripheral), lymphatic system, pelvis, skin, soft  
15 tissue, spleen, thorax, and urogenital tract.

Similarly, other hyperproliferative disorders can also be treated or detected by polynucleotides or polypeptides, or agonists or antagonists of the present invention. Examples of such hyperproliferative disorders include, but are not limited to: Acute Childhood Lymphoblastic Leukemia, Acute Lymphoblastic Leukemia, Acute Lymphocytic Leukemia, Acute Myeloid  
20 Leukemia, Adrenocortical Carcinoma, Adult (Primary) Hepatocellular Cancer, Adult (Primary) Liver Cancer, Adult Acute Lymphocytic Leukemia, Adult Acute Myeloid Leukemia, Adult Hodgkin's Disease, Adult Hodgkin's Lymphoma, Adult Lymphocytic Leukemia, Adult Non-Hodgkin's Lymphoma, Adult Primary Liver Cancer, Adult Soft Tissue Sarcoma, AIDS-Related Lymphoma, AIDS-Related Malignancies, Anal Cancer, Astrocytoma, Bile Duct Cancer, Bladder  
25 Cancer, Bone Cancer, Brain Stem Glioma, Brain Tumors, Breast Cancer, Cancer of the Renal Pelvis and Ureter, Central Nervous System (Primary) Lymphoma, Central Nervous System Lymphoma, Cerebellar Astrocytoma, Cerebral Astrocytoma, Cervical Cancer, Childhood (Primary) Hepatocellular Cancer, Childhood (Primary) Liver Cancer, Childhood Acute Lymphoblastic Leukemia, Childhood Acute Myeloid Leukemia, Childhood Brain Stem Glioma,  
30 Childhood Cerebellar Astrocytoma, Childhood Cerebral Astrocytoma, Childhood Extracranial Germ Cell Tumors, Childhood Hodgkin's Disease, Childhood Hodgkin's Lymphoma, Childhood Hypothalamic and Visual Pathway Glioma, Childhood Lymphoblastic Leukemia, Childhood Medulloblastoma, Childhood Non-Hodgkin's Lymphoma, Childhood Pineal and Supratentorial Primitive Neuroectodermal Tumors, Childhood Primary Liver Cancer, Childhood  
35 Rhabdomyosarcoma, Childhood Soft Tissue Sarcoma, Childhood Visual Pathway and Hypothalamic Glioma, Chronic Lymphocytic Leukemia, Chronic Myelogenous Leukemia, Colon



Cancer, Cutaneous T-Cell Lymphoma, Endocrine Pancreas Islet Cell Carcinoma, Endometrial Cancer, Ependymoma, Epithelial Cancer, Esophageal Cancer, Ewing's Sarcoma and Related Tumors, Exocrine Pancreatic Cancer, Extracranial Germ Cell Tumor, Extragonadal Germ Cell Tumor, Extrahepatic Bile Duct Cancer, Eye Cancer, Female Breast Cancer, Gaucher's Disease, Gallbladder Cancer, Gastric Cancer, Gastrointestinal Carcinoid Tumor, Gastrointestinal Tumors, Germ Cell Tumors, Gestational Trophoblastic Tumor, Hairy Cell Leukemia, Head and Neck Cancer, Hepatocellular Cancer, Hodgkin's Disease, Hodgkin's Lymphoma, Hypergammaglobulinemia, Hypopharyngeal Cancer, Intestinal Cancers, Intraocular Melanoma, Islet Cell Carcinoma, Islet Cell Pancreatic Cancer, Kaposi's Sarcoma, Kidney Cancer, Laryngeal Cancer, Lip and Oral Cavity Cancer, Liver Cancer, Lung Cancer, Lymphoproliferative Disorders, Macroglobulinemia, Male Breast Cancer, Malignant Mesothelioma, Malignant Thymoma, Medulloblastoma, Melanoma, Mesothelioma, Metastatic Occult Primary Squamous Neck Cancer, Metastatic Primary Squamous Neck Cancer, Metastatic Squamous Neck Cancer, Multiple Myeloma, Multiple Myeloma/Plasma Cell Neoplasm, Myelodysplastic Syndrome, Myelogenous Leukemia, Myeloid Leukemia, Myeloproliferative Disorders, Nasal Cavity and Paranasal Sinus Cancer, Nasopharyngeal Cancer, Neuroblastoma, Non-Hodgkin's Lymphoma During Pregnancy, Nonmelanoma Skin Cancer, Non-Small Cell Lung Cancer, Occult Primary Metastatic Squamous Neck Cancer, Oropharyngeal Cancer, Osteo-/Malignant Fibrous Sarcoma, Osteosarcoma/Malignant Fibrous Histiocytoma, Osteosarcoma/Malignant Fibrous Histiocytoma of Bone, Ovarian Epithelial Cancer, Ovarian Germ Cell Tumor, Ovarian Low Malignant Potential Tumor, Pancreatic Cancer, Paraproteinemia, Purpura, Parathyroid Cancer, Penile Cancer, Pheochromocytoma, Pituitary Tumor, Plasma Cell Neoplasm/Multiple Myeloma, Primary Central Nervous System Lymphoma, Primary Liver Cancer, Prostate Cancer, Rectal Cancer, Renal Cell Cancer, Renal Pelvis and Ureter Cancer, Retinoblastoma, Rhabdomyosarcoma, Salivary Gland Cancer, Sarcoidosis Sarcomas, Sezary Syndrome, Skin Cancer, Small Cell Lung Cancer, Small Intestine Cancer, Soft Tissue Sarcoma, Squamous Neck Cancer, Stomach Cancer, Supratentorial Primitive Neuroectodermal and Pineal Tumors, T-Cell Lymphoma, Testicular Cancer, Thymoma, Thyroid Cancer, Transitional Cell Cancer of the Renal Pelvis and Ureter, Transitional Renal Pelvis and Ureter Cancer, Trophoblastic Tumors, Ureter and Renal Pelvis Cell Cancer, Urethral Cancer, Uterine Cancer, Uterine Sarcoma, Vaginal Cancer, Visual Pathway and Hypothalamic Glioma, Vulvar Cancer, Waldenstrom's Macroglobulinemia, Wilms' Tumor, and any other hyperproliferative disease, besides neoplasia, located in an organ system listed above.

In another preferred embodiment, polynucleotides or polypeptides, or agonists or antagonists of the present invention are used to detect, prevent, diagnose, prognosticate, treat, and/or ameliorate premalignant conditions and to prevent progression to a neoplastic or malignant state, including but not limited to those disorders described above. Such uses are indicated in conditions known or suspected of preceding progression to neoplasia or cancer, in particular,

where non-neoplastic cell growth consisting of hyperplasia, metaplasia, or most particularly, dysplasia has occurred (for review of such abnormal growth conditions, see Robbins and Angell, 1976, Basic Pathology, 2d Ed., W. B. Saunders Co., Philadelphia, pp. 68-79.)

Hyperplasia is a form of controlled cell proliferation, involving an increase in cell number in a tissue or organ, without significant alteration in structure or function. Hyperplastic disorders which can be detected, prevented, diagnosed, prognosticated, treated, and/or ameliorated with compositions of the invention (including polynucleotides, polypeptides, agonists or antagonists) include, but are not limited to, angiofollicular mediastinal lymph node hyperplasia, angiolymphoid hyperplasia with eosinophilia, atypical melanocytic hyperplasia, basal cell hyperplasia, benign giant lymph node hyperplasia, cementum hyperplasia, congenital adrenal hyperplasia, congenital sebaceous hyperplasia, cystic hyperplasia, cystic hyperplasia of the breast, denture hyperplasia, ductal hyperplasia, endometrial hyperplasia, fibromuscular hyperplasia, focal epithelial hyperplasia, gingival hyperplasia, inflammatory fibrous hyperplasia, inflammatory papillary hyperplasia, intravascular papillary endothelial hyperplasia, nodular hyperplasia of prostate, nodular regenerative hyperplasia, pseudoepitheliomatous hyperplasia, senile sebaceous hyperplasia, and verrucous hyperplasia.

Metaplasia is a form of controlled cell growth in which one type of adult or fully differentiated cell substitutes for another type of adult cell. Metaplastic disorders which can be detected, prevented, diagnosed, prognosticated, treated, and/or ameliorated with compositions of the invention (including polynucleotides, polypeptides, agonists or antagonists) include, but are not limited to, agnogenic myeloid metaplasia, apocrine metaplasia, atypical metaplasia, autoparenchymatous metaplasia, connective tissue metaplasia, epithelial metaplasia, intestinal metaplasia, metaplastic anemia, metaplastic ossification, metaplastic polyps, myeloid metaplasia, primary myeloid metaplasia, secondary myeloid metaplasia, squamous metaplasia, squamous metaplasia of amnion, and symptomatic myeloid metaplasia.

Dysplasia is frequently a forerunner of cancer, and is found mainly in the epithelia; it is the most disorderly form of non-neoplastic cell growth, involving a loss in individual cell uniformity and in the architectural orientation of cells. Dysplastic cells often have abnormally large, deeply stained nuclei, and exhibit pleomorphism. Dysplasia characteristically occurs where there exists chronic irritation or inflammation. Dysplastic disorders which can be detected, prevented, diagnosed, prognosticated, treated, and/or ameliorated with compositions of the invention (including polynucleotides, polypeptides, agonists or antagonists) include, but are not limited to, anhidrotic ectodermal dysplasia, anterofacial dysplasia, asphyxiating thoracic dysplasia, atrioidigital dysplasia, bronchopulmonary dysplasia, cerebral dysplasia, cervical dysplasia, chondroectodermal dysplasia, cleidocranial dysplasia, congenital ectodermal dysplasia, craniodiaphysial dysplasia, craniocarpotarsal dysplasia, craniometaphysial dysplasia, dentin

dysplasia, diaphysial dysplasia, ectodermal dysplasia, enamel dysplasia, encephalo-ophthalmic dysplasia, dysplasia epiphysialis hemimelia, dysplasia epiphysialis multiplex, dysplasia epiphysialis punctata, epithelial dysplasia, faciodigitogenital dysplasia, familial fibrous dysplasia of jaws, familial white folded dysplasia, fibromuscular dysplasia, fibrous dysplasia of bone, florid  
 5 osseous dysplasia, hereditary renal-retinal dysplasia, hidrotic ectodermal dysplasia, hypohidrotic ectodermal dysplasia, lymphopenic thymic dysplasia, mammary dysplasia, mandibulofacial dysplasia, metaphysial dysplasia, Mondini dysplasia, monostotic fibrous dysplasia, mucoepithelial dysplasia, multiple epiphysial dysplasia, oculoauriculovertebral dysplasia, oculodentodigital dysplasia, oculovertbral dysplasia, odontogenic dysplasia, ophthalmomandibulomelic dysplasia,  
 10 periapical cemental dysplasia, polyostotic fibrous dysplasia, pseudoachondroplastic spondyloepiphysial dysplasia, retinal dysplasia, septo-optic dysplasia, spondyloepiphysial dysplasia, and ventriculoradial dysplasia.

Additional pre-neoplastic disorders which can be detected, prevented, diagnosed, prognosticated, treated, and/or ameliorated with compositions of the invention (including  
 15 polynucleotides, polypeptides, agonists or antagonists) include, but are not limited to, benign dysproliferative disorders (e.g., benign tumors, fibrocystic conditions, tissue hypertrophy, intestinal polyps, colon polyps, and esophageal dysplasia), leukoplakia, keratoses, Bowen's disease, Farmer's Skin, solar cheilitis, and solar keratosis.

In another embodiment, a polypeptide of the invention, or polynucleotides, antibodies,  
 20 agonists, or antagonists corresponding to that polypeptide, may be used to diagnose and/or prognosticate disorders associated with the tissue(s) in which the polypeptide of the invention is expressed, including one, two, three, four, five, or more tissues disclosed in Table 1B.2, column 5 (Tissue Distribution Library Code).

In another embodiment, polynucleotides, polypeptides, antibodies, and/or agonists or  
 25 antagonists of the present invention conjugated to a toxin or a radioactive isotope, as described herein, may be used to treat cancers and neoplasms, including, but not limited to those described herein. In a further preferred embodiment, polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention conjugated to a toxin or a radioactive isotope, as described herein, may be used to treat acute myelogenous leukemia.

30 Additionally, polynucleotides, polypeptides, and/or agonists or antagonists of the invention may affect apoptosis, and therefore, would be useful in treating a number of diseases associated with increased cell survival or the inhibition of apoptosis. For example, diseases associated with increased cell survival or the inhibition of apoptosis that could be detected, prevented, diagnosed, prognosticated, treated, and/or ameliorated by polynucleotides,  
 35 polypeptides, and/or agonists or antagonists of the invention, include cancers (such as follicular lymphomas, carcinomas with p53 mutations, and hormone-dependent tumors, including, but not

limited to colon cancer, cardiac tumors, pancreatic cancer, melanoma, retinoblastoma, glioblastoma, lung cancer, intestinal cancer, testicular cancer, stomach cancer, neuroblastoma, myxoma, myoma, lymphoma, endothelioma, osteoblastoma, osteoclastoma, osteosarcoma, chondrosarcoma, adenoma, breast cancer, prostate cancer, Kaposi's sarcoma and ovarian cancer);

5 autoimmune disorders such as, multiple sclerosis, Sjogren's syndrome, Hashimoto's thyroiditis, biliary cirrhosis, Behcet's disease, Crohn's disease, polymyositis, systemic lupus erythematosus and immune-related glomerulonephritis and rheumatoid arthritis) and viral infections (such as herpes viruses, pox viruses and adenoviruses), inflammation, graft v. host disease, acute graft rejection, and chronic graft rejection.

10 In preferred embodiments, polynucleotides, polypeptides, and/or agonists or antagonists of the invention are used to inhibit growth, progression, and/or metastasis of cancers, in particular those listed above.

Additional diseases or conditions associated with increased cell survival that could be detected, prevented, diagnosed, prognosticated, treated, and/or ameliorated by polynucleotides, polypeptides, and/or agonists or antagonists of the invention, include, but are not limited to,

15 progression, and/or metastases of malignancies and related disorders such as leukemia (including acute leukemias (e.g., acute lymphocytic leukemia, acute myelocytic leukemia (including myeloblastic, promyelocytic, myelomonocytic, monocytic, and erythroleukemia)) and chronic leukemias (e.g., chronic myelocytic (granulocytic) leukemia and chronic lymphocytic leukemia)),

20 polycythemia vera, lymphomas (e.g., Hodgkin's disease and non-Hodgkin's disease), multiple myeloma, Waldenstrom's macroglobulinemia, heavy chain disease, and solid tumors including, but not limited to, sarcomas and carcinomas such as fibrosarcoma, myxosarcoma, liposarcoma, chondrosarcoma, osteogenic sarcoma, chordoma, angiosarcoma, endotheliosarcoma, lymphangiosarcoma, lymphangioendotheliosarcoma, synovioma, mesothelioma, Ewing's tumor,

25 leiomyosarcoma, rhabdomyosarcoma, colon carcinoma, pancreatic cancer, breast cancer, ovarian cancer, prostate cancer, squamous cell carcinoma, basal cell carcinoma, adenocarcinoma, sweat gland carcinoma, sebaceous gland carcinoma, papillary carcinoma, papillary adenocarcinomas, cystadenocarcinoma, medullary carcinoma, bronchogenic carcinoma, renal cell carcinoma, hepatoma, bile duct carcinoma, choriocarcinoma, seminoma, embryonal carcinoma, Wilm's tumor,

30 cervical cancer, testicular tumor, lung carcinoma, small cell lung carcinoma, bladder carcinoma, epithelial carcinoma, glioma, astrocytoma, medulloblastoma, craniopharyngioma, ependymoma, pinealoma, emangioblastoma, acoustic neuroma, oligodendroglioma, menangioma, melanoma, neuroblastoma, and retinoblastoma.

Diseases associated with increased apoptosis that could be detected, prevented,

35 diagnosed, prognosticated, treated, and/or ameliorated by polynucleotides, polypeptides, and/or agonists or antagonists of the invention, include AIDS; neurodegenerative disorders (such as

Alzheimer's disease, Parkinson's disease, amyotrophic lateral sclerosis, retinitis pigmentosa, cerebellar degeneration and brain tumor or prior associated disease); autoimmune disorders (such as, multiple sclerosis, Sjogren's syndrome, Hashimoto's thyroiditis, biliary cirrhosis, Behcet's disease, Crohn's disease, polymyositis, systemic lupus erythematosus and immune-related glomerulonephritis and rheumatoid arthritis) myelodysplastic syndromes (such as aplastic anemia), graft v. host disease, ischemic injury (such as that caused by myocardial infarction, stroke and reperfusion injury), liver injury (e.g., hepatitis related liver injury, ischemia/reperfusion injury, cholestosis (bile duct injury) and liver cancer); toxin-induced liver disease (such as that caused by alcohol), septic shock, cachexia and anorexia.

Hyperproliferative diseases and/or disorders that could be detected, prevented, diagnosed, prognosticated, treated, and/or ameliorated by polynucleotides, polypeptides, and/or agonists or antagonists of the invention, include, but are not limited to, neoplasms located in the liver, abdomen, bone, breast, digestive system, pancreas, peritoneum, endocrine glands (adrenal, parathyroid, pituitary, testicles, ovary, thymus, thyroid), eye, head and neck, nervous system (central and peripheral), lymphatic system, pelvis, skin, soft tissue, spleen, thorax, and urogenital tract.

Similarly, other hyperproliferative disorders can also be detected, prevented, diagnosed, prognosticated, treated, and/or ameliorated by polynucleotides, polypeptides, and/or agonists or antagonists of the invention. Examples of such hyperproliferative disorders include, but are not limited to: hypergammaglobulinemia, lymphoproliferative disorders, paraproteinemias, purpura, sarcoidosis, Sezary Syndrome, Waldenström's macroglobulinemia, Gaucher's Disease, histiocytosis, and any other hyperproliferative disease, besides neoplasia, located in an organ system listed above.

Another preferred embodiment utilizes polynucleotides of the present invention to inhibit aberrant cellular division, by gene therapy using the present invention, and/or protein fusions or fragments thereof.

Thus, the present invention provides a method for treating cell proliferative disorders by inserting into an abnormally proliferating cell a polynucleotide of the present invention, wherein said polynucleotide represses said expression.

Another embodiment of the present invention provides a method of treating cell-proliferative disorders in individuals comprising administration of one or more active gene copies of the present invention to an abnormally proliferating cell or cells. In a preferred embodiment, polynucleotides of the present invention is a DNA construct comprising a recombinant expression vector effective in expressing a DNA sequence encoding said polynucleotides. In another preferred embodiment of the present invention, the DNA construct encoding the polynucleotides of the present invention is inserted into cells to be treated utilizing a retrovirus, or more preferably an

adenoviral vector (See G J. Nabel, et. al., PNAS 1999 96: 324-326, which is hereby incorporated by reference). In a most preferred embodiment, the viral vector is defective and will not transform non-proliferating cells, only proliferating cells. Moreover, in a preferred embodiment, the polynucleotides of the present invention inserted into proliferating cells either alone, or in  
5 combination with or fused to other polynucleotides, can then be modulated via an external stimulus (i.e. magnetic, specific small molecule, chemical, or drug administration, etc.), which acts upon the promoter upstream of said polynucleotides to induce expression of the encoded protein product. As such the beneficial therapeutic affect of the present invention may be expressly modulated (i.e. to increase, decrease, or inhibit expression of the present invention) based upon  
10 said external stimulus.

Polynucleotides of the present invention may be useful in repressing expression of oncogenic genes or antigens. By "repressing expression of the oncogenic genes " is intended the suppression of the transcription of the gene, the degradation of the gene transcript (pre-message RNA), the inhibition of splicing, the destruction of the messenger RNA, the prevention of the post-  
15 translational modifications of the protein, the destruction of the protein, or the inhibition of the normal function of the protein.

For local administration to abnormally proliferating cells, polynucleotides of the present invention may be administered by any method known to those of skill in the art including, but not limited to transfection, electroporation, microinjection of cells, or in vehicles such as  
20 liposomes, lipofectin, or as naked polynucleotides, or any other method described throughout the specification. The polynucleotide of the present invention may be delivered by known gene delivery systems such as, but not limited to, retroviral vectors (Gilboa, J. Virology 44:845 (1982); Hocke, Nature 320:275 (1986); Wilson, et al., Proc. Natl. Acad. Sci. U.S.A. 85:3014), vaccinia virus system (Chakrabarty et al., Mol. Cell Biol. 5:3403 (1985) or other efficient DNA delivery  
25 systems (Yates et al., Nature 313:812 (1985)) known to those skilled in the art. These references are exemplary only and are hereby incorporated by reference. In order to specifically deliver or transfect cells which are abnormally proliferating and spare non-dividing cells, it is preferable to utilize a retrovirus, or adenoviral (as described in the art and elsewhere herein) delivery system known to those of skill in the art. Since host DNA replication is required for retroviral DNA to  
30 integrate and the retrovirus will be unable to self replicate due to the lack of the retrovirus genes needed for its life cycle. Utilizing such a retroviral delivery system for polynucleotides of the present invention will target said gene and constructs to abnormally proliferating cells and will spare the non-dividing normal cells.

The polynucleotides of the present invention may be delivered directly to cell  
35 proliferative disorder/disease sites in internal organs, body cavities and the like by use of imaging

devices used to guide an injecting needle directly to the disease site. The polynucleotides of the present invention may also be administered to disease sites at the time of surgical intervention.

By "cell proliferative disease" is meant any human or animal disease or disorder, affecting any one or any combination of organs, cavities, or body parts, which is characterized by single or multiple local abnormal proliferations of cells, groups of cells, or tissues, whether benign or malignant.

Any amount of the polynucleotides of the present invention may be administered as long as it has a biologically inhibiting effect on the proliferation of the treated cells. Moreover, it is possible to administer more than one of the polynucleotide of the present invention simultaneously to the same site. By "biologically inhibiting" is meant partial or total growth inhibition as well as decreases in the rate of proliferation or growth of the cells. The biologically inhibitory dose may be determined by assessing the effects of the polynucleotides of the present invention on target malignant or abnormally proliferating cell growth in tissue culture, tumor growth in animals and cell cultures, or any other method known to one of ordinary skill in the art.

The present invention is further directed to antibody-based therapies which involve administering of anti-polypeptides and anti-polynucleotide antibodies to a mammalian, preferably human, patient for treating one or more of the described disorders. Methods for producing anti-polypeptides and anti-polynucleotide antibodies polyclonal and monoclonal antibodies are described in detail elsewhere herein. Such antibodies may be provided in pharmaceutically acceptable compositions as known in the art or as described herein.

A summary of the ways in which the antibodies of the present invention may be used therapeutically includes binding polynucleotides or polypeptides of the present invention locally or systemically in the body or by direct cytotoxicity of the antibody, e.g. as mediated by complement (CDC) or by effector cells (ADCC). Some of these approaches are described in more detail below. Armed with the teachings provided herein, one of ordinary skill in the art will know how to use the antibodies of the present invention for diagnosis, prognosis, monitoring, or therapeutic purposes without undue experimentation.

In particular, the antibodies, fragments and derivatives of the present invention are useful for treating a subject having or developing cell proliferative and/or differentiation disorders as described herein. Such treatment comprises administering a single or multiple doses of the antibody, or a fragment, derivative, or a conjugate thereof.

The antibodies of this invention may be advantageously utilized in combination with other monoclonal or chimeric antibodies, or with lymphokines or hematopoietic growth factors, for example., which serve to increase the number or activity of effector cells which interact with the antibodies.

It is preferred to use high affinity and/or potent *in vivo* inhibiting and/or neutralizing antibodies against polypeptides or polynucleotides of the present invention, fragments or regions thereof, for both immunoassays directed to and therapy of disorders related to polynucleotides or polypeptides, including fragments thereof, of the present invention. Such antibodies, fragments, or regions, will preferably have an affinity for polynucleotides or polypeptides, including fragments thereof. Preferred binding affinities include those with a dissociation constant or Kd less than  $5 \times 10^{-6} \text{M}$ ,  $10^{-6} \text{M}$ ,  $5 \times 10^{-7} \text{M}$ ,  $10^{-7} \text{M}$ ,  $5 \times 10^{-8} \text{M}$ ,  $10^{-8} \text{M}$ ,  $5 \times 10^{-9} \text{M}$ ,  $10^{-9} \text{M}$ ,  $5 \times 10^{-10} \text{M}$ ,  $10^{-10} \text{M}$ ,  $5 \times 10^{-11} \text{M}$ ,  $10^{-11} \text{M}$ ,  $5 \times 10^{-12} \text{M}$ ,  $10^{-12} \text{M}$ ,  $5 \times 10^{-13} \text{M}$ ,  $10^{-13} \text{M}$ ,  $5 \times 10^{-14} \text{M}$ ,  $10^{-14} \text{M}$ ,  $5 \times 10^{-15} \text{M}$ , and  $10^{-15} \text{M}$ .

Moreover, polypeptides of the present invention are useful in inhibiting the angiogenesis of proliferative cells or tissues, either alone, as a protein fusion, or in combination with other polypeptides directly or indirectly, as described elsewhere herein. In a most preferred embodiment, said anti-angiogenesis effect may be achieved indirectly, for example, through the inhibition of hematopoietic, tumor-specific cells, such as tumor-associated macrophages (See Joseph IB, et al. J Natl Cancer Inst, 90(21):1648-53 (1998), which is hereby incorporated by reference). Antibodies directed to polypeptides or polynucleotides of the present invention may also result in inhibition of angiogenesis directly, or indirectly (See Witte L, et al., Cancer Metastasis Rev. 17(2):155-61 (1998), which is hereby incorporated by reference)).

Polypeptides, including protein fusions, of the present invention, or fragments thereof may be useful in inhibiting proliferative cells or tissues through the induction of apoptosis. Said polypeptides may act either directly, or indirectly to induce apoptosis of proliferative cells and tissues, for example in the activation of a death-domain receptor, such as tumor necrosis factor (TNF) receptor-1, CD95 (Fas/APO-1), TNF-receptor-related apoptosis-mediated protein (TRAMP) and TNF-related apoptosis-inducing ligand (TRAIL) receptor-1 and -2 (See Schulze-Osthoff K, et.al., Eur J Biochem 254(3):439-59 (1998), which is hereby incorporated by reference). Moreover, in another preferred embodiment of the present invention, said polypeptides may induce apoptosis through other mechanisms, such as in the activation of other proteins which will activate apoptosis, or through stimulating the expression of said proteins, either alone or in combination with small molecule drugs or adjuvants, such as apoptonin, galectins, thioredoxins, anti-inflammatory proteins (See for example, Mutat Res 400(1-2):447-55 (1998), Med Hypotheses 50(5):423-33 (1998), Chem Biol Interact. Apr 24;111-112:23-34 (1998), J Mol Med. 76(6):402-12 (1998), Int J Tissue React; 20(1):3-15 (1998), which are all hereby incorporated by reference).

Polypeptides, including protein fusions to, or fragments thereof, of the present invention are useful in inhibiting the metastasis of proliferative cells or tissues. Inhibition may occur as a direct result of administering polypeptides, or antibodies directed to said polypeptides



as described elsewhere herein, or indirectly, such as activating the expression of proteins known to inhibit metastasis, for example alpha 4 integrins, (See, e.g., Curr Top Microbiol Immunol 1998;231:125-41, which is hereby incorporated by reference). Such therapeutic affects of the present invention may be achieved either alone, or in combination with small molecule drugs or  
5 adjuvants.

In another embodiment, the invention provides a method of delivering compositions containing the polypeptides of the invention (e.g., compositions containing polypeptides or polypeptide antibodies associated with heterologous polypeptides, heterologous nucleic acids, toxins, or prodrugs) to targeted cells expressing the polypeptide of the present invention.  
10 Polypeptides or polypeptide antibodies of the invention may be associated with with heterologous polypeptides, heterologous nucleic acids, toxins, or prodrugs via hydrophobic, hydrophilic, ionic and/or covalent interactions.

Polypeptides, protein fusions to, or fragments thereof, of the present invention are useful in enhancing the immunogenicity and/or antigenicity of proliferating cells or tissues, either  
15 directly, such as would occur if the polypeptides of the present invention 'vaccinated' the immune response to respond to proliferative antigens and immunogens, or indirectly, such as in activating the expression of proteins known to enhance the immune response (e.g. chemokines), to said antigens and immunogens.

## 20 Renal Disorders

Polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention, may be used to detect, prevent, diagnose, prognosticate, treat, and/or ameliorate disorders of the renal system. Renal disorders which can be detected, prevented, diagnosed, prognosticated, treated, and/or ameliorated with compositions of the invention include, but are not  
25 limited to, kidney failure, nephritis, blood vessel disorders of kidney, metabolic and congenital kidney disorders, urinary disorders of the kidney, autoimmune disorders, sclerosis and necrosis, electrolyte imbalance, and kidney cancers.

Kidney diseases which can be detected, prevented, diagnosed, prognosticated, treated, and/or ameliorated with compositions of the invention include, but are not limited to, acute kidney  
30 failure, chronic kidney failure, atheroembolic renal failure, end-stage renal disease, inflammatory diseases of the kidney (e.g., acute glomerulonephritis, postinfectious glomerulonephritis, rapidly progressive glomerulonephritis, nephrotic syndrome, membranous glomerulonephritis, familial nephrotic syndrome, membranoproliferative glomerulonephritis I and II, mesangial proliferative glomerulonephritis, chronic glomerulonephritis, acute tubulointerstitial nephritis, chronic  
35 tubulointerstitial nephritis, acute post-streptococcal glomerulonephritis (PSGN), pyelonephritis, lupus nephritis, chronic nephritis, interstitial nephritis, and post-streptococcal glomerulonephritis),

blood vessel disorders of the kidneys (e.g., kidney infarction, atheroembolic kidney disease, cortical necrosis, malignant nephrosclerosis, renal vein thrombosis, renal underperfusion, renal retinopathy, renal ischemia-reperfusion, renal artery embolism, and renal artery stenosis), and kidney disorders resulting from urinary tract disease (e.g., pyelonephritis, hydronephrosis, urolithiasis (renal lithiasis, nephrolithiasis), reflux nephropathy, urinary tract infections, urinary retention, and acute or chronic unilateral obstructive uropathy.)

In addition, compositions of the invention can be used to detect, prevent, diagnose, prognosticate, treat, and/or ameliorate metabolic and congenital disorders of the kidney (e.g., uremia, renal amyloidosis, renal osteodystrophy, renal tubular acidosis, renal glycosuria, nephrogenic diabetes insipidus, cystinuria, Fanconi's syndrome, renal fibrocystic osteosis (renal rickets), Hartnup disease, Bartter's syndrome, Liddle's syndrome, polycystic kidney disease, medullary cystic disease, medullary sponge kidney, Alport's syndrome, nail-patella syndrome, congenital nephrotic syndrome, CRUSH syndrome, horseshoe kidney, diabetic nephropathy, nephrogenic diabetes insipidus, analgesic nephropathy, kidney stones, and membranous nephropathy), and autoimmune disorders of the kidney (e.g., systemic lupus erythematosus (SLE), Goodpasture syndrome, IgA nephropathy, and IgM mesangial proliferative glomerulonephritis).

Compositions of the invention can also be used to detect, prevent, diagnose, prognosticate, treat, and/or ameliorate sclerotic or necrotic disorders of the kidney (e.g., glomerulosclerosis, diabetic nephropathy, focal segmental glomerulosclerosis (FSGS), necrotizing glomerulonephritis, and renal papillary necrosis), cancers of the kidney (e.g., nephroma, hypernephroma, nephroblastoma, renal cell cancer, transitional cell cancer, renal adenocarcinoma, squamous cell cancer, and Wilm's tumor), and electrolyte imbalances (e.g., nephrocalcinosis, pyuria, edema, hydronephritis, proteinuria, hyponatremia, hypernatremia, hypokalemia, hyperkalemia, hypocalcemia, hypercalcemia, hypophosphatemia, and hyperphosphatemia).

Polypeptides may be administered using any method known in the art, including, but not limited to, direct needle injection at the delivery site, intravenous injection, topical administration, catheter infusion, biolistic injectors, particle accelerators, gelfoam sponge depots, other commercially available depot materials, osmotic pumps, oral or suppository solid pharmaceutical formulations, decanting or topical applications during surgery, aerosol delivery. Such methods are known in the art. Polypeptides may be administered as part of a Therapeutic, described in more detail below. Methods of delivering polynucleotides are described in more detail herein.

#### **Cardiovascular Disorders**

Polynucleotides or polypeptides, or agonists or antagonists of the present invention, may be used to detect, prevent, diagnose, prognosticate, treat, and/or ameliorate cardiovascular

diseases and disorders, including, but not limited to, peripheral artery disease, such as limb ischemia.

Cardiovascular disorders include, but are not limited to, cardiovascular abnormalities, such as arterio-arterial fistula, arteriovenous fistula, cerebral arteriovenous malformations, congenital heart defects, pulmonary atresia, and Scimitar Syndrome. Congenital heart defects include, but are not limited to, aortic coarctation, cor triatriatum, coronary vessel anomalies, crisscross heart, dextrocardia, patent ductus arteriosus, Ebstein's anomaly, Eisenmenger complex, hypoplastic left heart syndrome, levocardia, tetralogy of fallot, transposition of great vessels, double outlet right ventricle, tricuspid atresia, persistent truncus arteriosus, and heart septal defects, such as aortopulmonary septal defect, endocardial cushion defects, Lutembacher's Syndrome, trilog of Fallot, ventricular heart septal defects.

Cardiovascular disorders also include, but are not limited to, heart disease, such as arrhythmias, carcinoid heart disease, high cardiac output, low cardiac output, cardiac tamponade, endocarditis (including bacterial), heart aneurysm, cardiac arrest, congestive heart failure, congestive cardiomyopathy, paroxysmal dyspnea, cardiac edema, heart hypertrophy, congestive cardiomyopathy, left ventricular hypertrophy, right ventricular hypertrophy, post-infarction heart rupture, ventricular septal rupture, heart valve diseases, myocardial diseases, myocardial ischemia, pericardial effusion, pericarditis (including constrictive and tuberculous), pneumopericardium, postpericardiotomy syndrome, pulmonary heart disease, rheumatic heart disease, ventricular dysfunction, hyperemia, cardiovascular pregnancy complications, Scimitar Syndrome, cardiovascular syphilis, and cardiovascular tuberculosis.

Arrhythmias include, but are not limited to, sinus arrhythmia, atrial fibrillation, atrial flutter, bradycardia, extrasystole, Adams-Stokes Syndrome, bundle-branch block, sinoatrial block, long QT syndrome, parasystole, Lown-Ganong-Levine Syndrome, Mahaim-type pre-excitation syndrome, Wolff-Parkinson-White syndrome, sick sinus syndrome, tachycardias, and ventricular fibrillation. Tachycardias include paroxysmal tachycardia, supraventricular tachycardia, accelerated idioventricular rhythm, atrioventricular nodal reentry tachycardia, ectopic atrial tachycardia, ectopic junctional tachycardia, sinoatrial nodal reentry tachycardia, sinus tachycardia, Torsades de Pointes, and ventricular tachycardia.

Heart valve diseases include, but are not limited to, aortic valve insufficiency, aortic valve stenosis, hear murmurs, aortic valve prolapse, mitral valve prolapse, tricuspid valve prolapse, mitral valve insufficiency, mitral valve stenosis, pulmonary atresia, pulmonary valve insufficiency, pulmonary valve stenosis, tricuspid atresia, tricuspid valve insufficiency, and tricuspid valve stenosis.

Myocardial diseases include, but are not limited to, alcoholic cardiomyopathy, congestive cardiomyopathy, hypertrophic cardiomyopathy, aortic subvalvular stenosis, pulmonary

subvalvular stenosis, restrictive cardiomyopathy, Chagas cardiomyopathy, endocardial fibroelastosis, endomyocardial fibrosis, Kearns Syndrome, myocardial reperfusion injury, and myocarditis.

5 Myocardial ischemias include, but are not limited to, coronary disease, such as angina pectoris, coronary aneurysm, coronary arteriosclerosis, coronary thrombosis, coronary vasospasm, myocardial infarction and myocardial stunning.

Cardiovascular diseases also include vascular diseases such as aneurysms, angiodyplasia, angiomas, bacillary angiomas, Hippel-Lindau Disease, Klippel-Trenaunay-Weber Syndrome, Sturge-Weber Syndrome, angioneurotic edema, aortic diseases, Takayasu's  
10 Arteritis, aortitis, Leriche's Syndrome, arterial occlusive diseases, arteritis, enarteritis, polyarteritis nodosa, cerebrovascular disorders, diabetic angiopathies, diabetic retinopathy, embolisms, thrombosis, erythromelalgia, hemorrhoids, hepatic veno-occlusive disease, hypertension, hypotension, ischemia, peripheral vascular diseases, phlebitis, pulmonary veno-occlusive disease, Raynaud's disease, CREST syndrome, retinal vein occlusion, Scimitar syndrome, superior vena  
15 cava syndrome, telangiectasia, ataxia telangiectasia, hereditary hemorrhagic telangiectasia, varicocele, varicose veins, varicose ulcer, vasculitis, and venous insufficiency.

Aneurysms include, but are not limited to, dissecting aneurysms, false aneurysms, infected aneurysms, ruptured aneurysms, aortic aneurysms, cerebral aneurysms, coronary aneurysms, heart aneurysms, and iliac aneurysms.

20 Arterial occlusive diseases include, but are not limited to, arteriosclerosis, intermittent claudication, carotid stenosis, fibromuscular dysplasias, mesenteric vascular occlusion, Moyamoya disease, renal artery obstruction, retinal artery occlusion, and thromboangiitis obliterans.

Cerebrovascular disorders include, but are not limited to, carotid artery diseases, cerebral amyloid angiopathy, cerebral aneurysm, cerebral anoxia, cerebral arteriosclerosis,  
25 cerebral arteriovenous malformation, cerebral artery diseases, cerebral embolism and thrombosis, carotid artery thrombosis, sinus thrombosis, Wallenberg's syndrome, cerebral hemorrhage, epidural hematoma, subdural hematoma, subarachnoid hemorrhage, cerebral infarction, cerebral ischemia (including transient), subclavian steal syndrome, periventricular leukomalacia, vascular headache, cluster headache, migraine, and vertebrobasilar insufficiency.

30 Embolisms include, but are not limited to, air embolisms, amniotic fluid embolisms, cholesterol embolisms, blue toe syndrome, fat embolisms, pulmonary embolisms, and thromboembolisms. Thrombosis include, but are not limited to, coronary thrombosis, hepatic vein thrombosis, retinal vein occlusion, carotid artery thrombosis, sinus thrombosis, Wallenberg's syndrome, and thrombophlebitis.

35 Ischemic disorders include, but are not limited to, cerebral ischemia, ischemic colitis, compartment syndromes, anterior compartment syndrome, myocardial ischemia, reperfusion

injuries, and peripheral limb ischemia. Vasculitis includes, but is not limited to, aortitis, arteritis, Behcet's Syndrome, Churg-Strauss Syndrome, mucocutaneous lymph node syndrome, thromboangiitis obliterans, hypersensitivity vasculitis, Schoenlein-Henoch purpura, allergic cutaneous vasculitis, and Wegener's granulomatosis.

- 5 Polypeptides may be administered using any method known in the art, including, but not limited to, direct needle injection at the delivery site, intravenous injection, topical administration, catheter infusion, biolistic injectors, particle accelerators, gelfoam sponge depots, other commercially available depot materials, osmotic pumps, oral or suppository solid pharmaceutical formulations, decanting or topical applications during surgery, aerosol delivery.
- 10 Such methods are known in the art. Polypeptides may be administered as part of a Therapeutic, described in more detail below. Methods of delivering polynucleotides are described in more detail herein.

#### Respiratory Disorders

- 15 Polynucleotides or polypeptides, or agonists or antagonists of the present invention may be used to detect, prevent, diagnose, prognosticate, treat, and/or ameliorate diseases and/or disorders of the respiratory system.

- Diseases and disorders of the respiratory system include, but are not limited to, nasal vestibulitis, nonallergic rhinitis (e.g., acute rhinitis, chronic rhinitis, atrophic rhinitis, vasomotor rhinitis), nasal polyps, and sinusitis, juvenile angiofibromas, cancer of the nose and juvenile papillomas, vocal cord polyps, nodules (singer's nodules), contact ulcers, vocal cord paralysis, laryngoceles, pharyngitis (e.g., viral and bacterial), tonsillitis, tonsillar cellulitis, parapharyngeal abscess, laryngitis, laryngoceles, and throat cancers (e.g., cancer of the nasopharynx, tonsil cancer, larynx cancer), lung cancer (e.g., squamous cell carcinoma, small cell (oat cell) carcinoma, large cell carcinoma, and adenocarcinoma), allergic disorders (eosinophilic pneumonia, hypersensitivity pneumonitis (e.g., extrinsic allergic alveolitis, allergic interstitial pneumonitis, organic dust pneumoconiosis, allergic bronchopulmonary aspergillosis, asthma, Wegener's granulomatosis (granulomatous vasculitis), Goodpasture's syndrome)), pneumonia (e.g., bacterial pneumonia (e.g., *Streptococcus pneumoniae* (pneumococcal pneumonia), *Staphylococcus aureus* (staphylococcal pneumonia), Gram-negative bacterial pneumonia (caused by, e.g., *Klebsiella* and *Pseudomonas* spp.), *Mycoplasma pneumoniae* pneumonia, *Hemophilus influenzae* pneumonia, *Legionella pneumophila* (Legionnaires' disease), and *Chlamydia psittaci* (Psittacosis)), and viral pneumonia (e.g., influenza, chickenpox (varicella).
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- Additional diseases and disorders of the respiratory system include, but are not limited to bronchiolitis, polio (poliomyelitis), croup, respiratory syncytial viral infection, mumps, erythema infectiosum (fifth disease), roseola infantum, progressive rubella panencephalitis,
- 35

german measles, and subacute sclerosing panencephalitis), fungal pneumonia (e.g., Histoplasmosis, Coccidioidomycosis, Blastomycosis, fungal infections in people with severely suppressed immune systems (e.g., cryptococcosis, caused by *Cryptococcus neoformans*; aspergillosis, caused by *Aspergillus spp.*; candidiasis, caused by *Candida*; and mucormycosis)),

5 *Pneumocystis carinii* (pneumocystis pneumonia), atypical pneumonias (e.g., *Mycoplasma* and *Chlamydia spp.*), opportunistic infection pneumonia, nosocomial pneumonia, chemical pneumonitis, and aspiration pneumonia, pleural disorders (e.g., pleurisy, pleural effusion, and pneumothorax (e.g., simple spontaneous pneumothorax, complicated spontaneous pneumothorax, tension pneumothorax)), obstructive airway diseases (e.g., asthma, chronic obstructive pulmonary

10 disease (COPD), emphysema, chronic or acute bronchitis), occupational lung diseases (e.g., silicosis, black lung (coal workers' pneumoconiosis), asbestosis, berylliosis, occupational asthma, byssinosis, and benign pneumoconioses), Infiltrative Lung Disease (e.g., pulmonary fibrosis (e.g., fibrosing alveolitis, usual interstitial pneumonia), idiopathic pulmonary fibrosis, desquamative interstitial pneumonia, lymphoid interstitial pneumonia, histiocytosis X (e.g., Letterer-Siwe

15 disease, Hand-Schüller-Christian disease, eosinophilic granuloma), idiopathic pulmonary hemosiderosis, sarcoidosis and pulmonary alveolar proteinosis), Acute respiratory distress syndrome (also called, e.g., adult respiratory distress syndrome), edema, pulmonary embolism, bronchitis (e.g., viral, bacterial), bronchiectasis, atelectasis, lung abscess (caused by, e.g., *Staphylococcus aureus* or *Legionella pneumophila*), and cystic fibrosis.

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#### Anti-Angiogenesis Activity

The naturally occurring balance between endogenous stimulators and inhibitors of angiogenesis is one in which inhibitory influences predominate. Rastinejad *et al.*, *Cell* 56:345-355 (1989). In those rare instances in which neovascularization occurs under normal physiological

25 conditions, such as wound healing, organ regeneration, embryonic development, and female reproductive processes, angiogenesis is stringently regulated and spatially and temporally delimited. Under conditions of pathological angiogenesis such as that characterizing solid tumor growth, these regulatory controls fail. Unregulated angiogenesis becomes pathologic and sustains progression of many neoplastic and non-neoplastic diseases. A number of serious diseases are

30 dominated by abnormal neovascularization including solid tumor growth and metastases, arthritis, some types of eye disorders, and psoriasis. See, e.g., reviews by Moses *et al.*, *Biotech.* 9:630-634 (1991); Folkman *et al.*, *N. Engl. J. Med.*, 333:1757-1763 (1995); Auerbach *et al.*, *J. Microvasc. Res.* 29:401-411 (1985); Folkman, *Advances in Cancer Research*, eds. Klein and Weinhouse, Academic Press, New York, pp. 175-203 (1985); Patz, *Am. J. Ophthalmol.* 94:715-743 (1982); and

35 Folkman *et al.*, *Science* 221:719-725 (1983). In a number of pathological conditions, the process of angiogenesis contributes to the disease state. For example, significant data have accumulated which suggest that the growth of solid tumors is dependent on angiogenesis. Folkman and

Klagsbrun, *Science* 235:442-447 (1987).

The present invention provides for treatment of diseases or disorders associated with neovascularization by administration of the polynucleotides and/or polypeptides of the invention, as well as agonists or antagonists of the present invention. Malignant and metastatic conditions which can be treated with the polynucleotides and polypeptides, or agonists or antagonists of the invention include, but are not limited to, malignancies, solid tumors, and cancers described herein and otherwise known in the art (for a review of such disorders, see Fishman *et al.*, *Medicine*, 2d Ed., J. B. Lippincott Co., Philadelphia (1985)). Thus, the present invention provides a method of treating an angiogenesis-related disease and/or disorder, comprising administering to an individual in need thereof a therapeutically effective amount of a polynucleotide, polypeptide, antagonist and/or agonist of the invention. For example, polynucleotides, polypeptides, antagonists and/or agonists may be utilized in a variety of additional methods in order to therapeutically treat a cancer or tumor. Cancers which may be treated with polynucleotides, polypeptides, antagonists and/or agonists include, but are not limited to solid tumors, including prostate, lung, breast, ovarian, stomach, pancreas, larynx, esophagus, testes, liver, parotid, biliary tract, colon, rectum, cervix, uterus, endometrium, kidney, bladder, thyroid cancer; primary tumors and metastases; melanomas; glioblastoma; Kaposi's sarcoma; leiomyosarcoma; non-small cell lung cancer; colorectal cancer; advanced malignancies; and blood born tumors such as leukemias. For example, polynucleotides, polypeptides, antagonists and/or agonists may be delivered topically, in order to treat cancers such as skin cancer, head and neck tumors, breast tumors, and Kaposi's sarcoma.

Within yet other aspects, polynucleotides, polypeptides, antagonists and/or agonists may be utilized to treat superficial forms of bladder cancer by, for example, intravesical administration. Polynucleotides, polypeptides, antagonists and/or agonists may be delivered directly into the tumor, or near the tumor site, via injection or a catheter. Of course, as the artisan of ordinary skill will appreciate, the appropriate mode of administration will vary according to the cancer to be treated. Other modes of delivery are discussed herein.

Polynucleotides, polypeptides, antagonists and/or agonists may be useful in treating other disorders, besides cancers, which involve angiogenesis. These disorders include, but are not limited to: benign tumors, for example hemangiomas, acoustic neuromas, neurofibromas, trachomas, and pyogenic granulomas; arteriosclerotic plaques; ocular angiogenic diseases, for example, diabetic retinopathy, retinopathy of prematurity, macular degeneration, corneal graft rejection, neovascular glaucoma, retrolental fibroplasia, rubeosis, retinoblastoma, uveitis and Pterygia (abnormal blood vessel growth) of the eye; rheumatoid arthritis; psoriasis; delayed wound healing; endometriosis; vasculogenesis; granulations; hypertrophic scars (keloids); nonunion fractures; scleroderma; trachoma; vascular adhesions; myocardial angiogenesis; coronary collaterals; cerebral collaterals; arteriovenous malformations; ischemic limb angiogenesis; Osler-

Webber Syndrome; plaque neovascularization; telangiectasia; hemophilic joints; angiofibroma; fibromuscular dysplasia; wound granulation; Crohn's disease; and atherosclerosis.

For example, within one aspect of the present invention methods are provided for treating hypertrophic scars and keloids, comprising the step of administering a polynucleotide, polypeptide, antagonist and/or agonist of the invention to a hypertrophic scar or keloid.

Within one embodiment of the present invention polynucleotides, polypeptides, antagonists and/or agonists of the invention are directly injected into a hypertrophic scar or keloid, in order to prevent the progression of these lesions. This therapy is of particular value in the prophylactic treatment of conditions which are known to result in the development of hypertrophic scars and keloids (e.g., burns), and is preferably initiated after the proliferative phase has had time to progress (approximately 14 days after the initial injury), but before hypertrophic scar or keloid development. As noted above, the present invention also provides methods for treating neovascular diseases of the eye, including for example, corneal neovascularization, neovascular glaucoma, proliferative diabetic retinopathy, retrolental fibroplasia and macular degeneration.

Moreover, Ocular disorders associated with neovascularization which can be treated with the polynucleotides and polypeptides of the present invention (including agonists and/or antagonists) include, but are not limited to: neovascular glaucoma, diabetic retinopathy, retinoblastoma, retrolental fibroplasia, uveitis, retinopathy of prematurity macular degeneration, corneal graft neovascularization, as well as other eye inflammatory diseases, ocular tumors and diseases associated with choroidal or iris neovascularization. See, e.g., reviews by Waltman *et al.*, *Am. J. Ophthalmol.* 85:704-710 (1978) and Gartner *et al.*, *Surv. Ophthalmol.* 22:291-312 (1978).

Thus, within one aspect of the present invention methods are provided for treating neovascular diseases of the eye such as corneal neovascularization (including corneal graft neovascularization), comprising the step of administering to a patient a therapeutically effective amount of a compound (as described above) to the cornea, such that the formation of blood vessels is inhibited. Briefly, the cornea is a tissue that normally lacks blood vessels. In certain pathological conditions however, capillaries may extend into the cornea from the pericorneal vascular plexus of the limbus. When the cornea becomes vascularized, it also becomes clouded, resulting in a decline in the patient's visual acuity. Visual loss may become complete if the cornea completely opacitates. A wide variety of disorders can result in corneal neovascularization, including for example, corneal infections (e.g., trachoma, herpes simplex keratitis, leishmaniasis and onchocerciasis), immunological processes (e.g., graft rejection and Stevens-Johnson's syndrome), alkali burns, trauma, inflammation (of any cause), toxic and nutritional deficiency states, and as a complication of wearing contact lenses.

Within particularly preferred embodiments of the invention, may be prepared for topical administration in saline (combined with any of the preservatives and antimicrobial agents



commonly used in ocular preparations), and administered in eyedrop form. The solution or suspension may be prepared in its pure form and administered several times daily. Alternatively, anti-angiogenic compositions, prepared as described above, may also be administered directly to the cornea. Within preferred embodiments, the anti-angiogenic composition is prepared with a muco-adhesive polymer that binds to cornea. Within further embodiments, the anti-angiogenic factors or anti-angiogenic compositions may be utilized as an adjunct to conventional steroid therapy. Topical therapy may also be useful prophylactically in corneal lesions which are known to have a high probability of inducing an angiogenic response (such as chemical burns). In these instances the treatment, likely in combination with steroids, may be instituted immediately to help prevent subsequent complications.

Within other embodiments, the compounds described above may be injected directly into the corneal stroma by an ophthalmologist under microscopic guidance. The preferred site of injection may vary with the morphology of the individual lesion, but the goal of the administration would be to place the composition at the advancing front of the vasculature (i.e., interspersed between the blood vessels and the normal cornea). In most cases this would involve perilimbal corneal injection to "protect" the cornea from the advancing blood vessels. This method may also be utilized shortly after a corneal insult in order to prophylactically prevent corneal neovascularization. In this situation the material could be injected in the perilimbal cornea interspersed between the corneal lesion and its undesired potential limbal blood supply. Such methods may also be utilized in a similar fashion to prevent capillary invasion of transplanted corneas. In a sustained-release form injections might only be required 2-3 times per year. A steroid could also be added to the injection solution to reduce inflammation resulting from the injection itself.

Within another aspect of the present invention, methods are provided for treating neovascular glaucoma, comprising the step of administering to a patient a therapeutically effective amount of a polynucleotide, polypeptide, antagonist and/or agonist to the eye, such that the formation of blood vessels is inhibited. In one embodiment, the compound may be administered topically to the eye in order to treat early forms of neovascular glaucoma. Within other embodiments, the compound may be implanted by injection into the region of the anterior chamber angle. Within other embodiments, the compound may also be placed in any location such that the compound is continuously released into the aqueous humor. Within another aspect of the present invention, methods are provided for treating proliferative diabetic retinopathy, comprising the step of administering to a patient a therapeutically effective amount of a polynucleotide, polypeptide, antagonist and/or agonist to the eyes, such that the formation of blood vessels is inhibited.

Within particularly preferred embodiments of the invention, proliferative diabetic

retinopathy may be treated by injection into the aqueous humor or the vitreous, in order to increase the local concentration of the polynucleotide, polypeptide, antagonist and/or agonist in the retina. Preferably, this treatment should be initiated prior to the acquisition of severe disease requiring photocoagulation.

5           Within another aspect of the present invention, methods are provided for treating retrolental fibroplasia, comprising the step of administering to a patient a therapeutically effective amount of a polynucleotide, polypeptide, antagonist and/or agonist to the eye, such that the formation of blood vessels is inhibited. The compound may be administered topically, via intravitreal injection and/or via intraocular implants.

10           Additionally, disorders which can be treated with the polynucleotides, polypeptides, agonists and/or antagonists include, but are not limited to, hemangioma, arthritis, psoriasis, angiofibroma, atherosclerotic plaques, delayed wound healing, granulations, hemophilic joints, hypertrophic scars, nonunion fractures, Osler-Weber syndrome, pyogenic granuloma, scleroderma, trachoma, and vascular adhesions.

15           Moreover, disorders and/or states, which can be detected, prevented, diagnosed, prognosticated, treated, and/or ameliorated with the the polynucleotides, polypeptides, agonists and/or antagonists of the invention include, but are not limited to, solid tumors, blood born tumors such as leukemias, tumor metastasis, Kaposi's sarcoma, benign tumors, for example hemangiomas, acoustic neuromas, neurofibromas, trachomas, and pyogenic granulomas, rheumatoid arthritis, psoriasis, ocular angiogenic diseases, for example, diabetic retinopathy, retinopathy of  
20           prematurity, macular degeneration, corneal graft rejection, neovascular glaucoma, retrolental fibroplasia, rubeosis, retinoblastoma, and uveitis, delayed wound healing, endometriosis, vasculogenesis, granulations, hypertrophic scars (keloids), nonunion fractures, scleroderma, trachoma, vascular adhesions, myocardial angiogenesis, coronary collaterals, cerebral collaterals, arteriovenous malformations, ischemic limb angiogenesis, Osler-Webber Syndrome, plaque  
25           neovascularization, telangiectasia, hemophilic joints, angiofibroma fibromuscular dysplasia, wound granulation, Crohn's disease, atherosclerosis, birth control agent by preventing vascularization required for embryo implantation controlling menstruation, diseases that have angiogenesis as a pathologic consequence such as cat scratch disease (Rochelie minalia quintosa),  
30           ulcers (*Helicobacter pylori*), Bartonellosis and bacillary angiomatosis.

          In one aspect of the birth control method, an amount of the compound sufficient to block embryo implantation is administered before or after intercourse and fertilization have occurred, thus providing an effective method of birth control, possibly a "morning after" method. Polynucleotides, polypeptides, agonists and/or antagonists may also be used in controlling  
35           menstruation or administered as either a peritoneal lavage fluid or for peritoneal implantation in the treatment of endometriosis.

Polynucleotides, polypeptides, agonists and/or agonists of the present invention may be incorporated into surgical sutures in order to prevent stitch granulomas.

Polynucleotides, polypeptides, agonists and/or agonists may be utilized in a wide variety of surgical procedures. For example, within one aspect of the present invention a  
5 compositions (in the form of, for example, a spray or film) may be utilized to coat or spray an area prior to removal of a tumor, in order to isolate normal surrounding tissues from malignant tissue, and/or to prevent the spread of disease to surrounding tissues. Within other aspects of the present invention, compositions (e.g., in the form of a spray) may be delivered via endoscopic procedures in order to coat tumors, or inhibit angiogenesis in a desired locale. Within yet other aspects of the  
10 present invention, surgical meshes which have been coated with anti-angiogenic compositions of the present invention may be utilized in any procedure wherein a surgical mesh might be utilized. For example, within one embodiment of the invention a surgical mesh laden with an anti-angiogenic composition may be utilized during abdominal cancer resection surgery (e.g., subsequent to colon resection) in order to provide support to the structure, and to release an  
15 amount of the anti-angiogenic factor.

Within further aspects of the present invention, methods are provided for treating tumor excision sites, comprising administering a polynucleotide, polypeptide, agonist and/or  
agonist to the resection margins of a tumor subsequent to excision, such that the local recurrence of cancer and the formation of new blood vessels at the site is inhibited. Within one embodiment  
20 of the invention, the anti-angiogenic compound is administered directly to the tumor excision site (e.g., applied by swabbing, brushing or otherwise coating the resection margins of the tumor with the anti-angiogenic compound). Alternatively, the anti-angiogenic compounds may be incorporated into known surgical pastes prior to administration. Within particularly preferred embodiments of the invention, the anti-angiogenic compounds are applied after hepatic resections  
25 for malignancy, and after neurosurgical operations.

Within one aspect of the present invention, polynucleotides, polypeptides, agonists and/or agonists may be administered to the resection margin of a wide variety of tumors, including for example, breast, colon, brain and hepatic tumors. For example, within one embodiment of the invention, anti-angiogenic compounds may be administered to the site of a neurological tumor  
30 subsequent to excision, such that the formation of new blood vessels at the site are inhibited.

The polynucleotides, polypeptides, agonists and/or agonists of the present invention may also be administered along with other anti-angiogenic factors. Representative examples of other anti-angiogenic factors include: Anti-Invasive Factor, retinoic acid and derivatives thereof, paclitaxel, Suramin, Tissue Inhibitor of Metalloproteinase-1, Tissue Inhibitor of  
35 Metalloproteinase-2, Plasminogen Activator Inhibitor-1, Plasminogen Activator Inhibitor-2, and various forms of the lighter "d group" transition metals.

Lighter "d group" transition metals include, for example, vanadium, molybdenum, tungsten, titanium, niobium, and tantalum species. Such transition metal species may form transition metal complexes. Suitable complexes of the above-mentioned transition metal species include oxo transition metal complexes.

5 Representative examples of vanadium complexes include oxo vanadium complexes such as vanadate and vanadyl complexes. Suitable vanadate complexes include metavanadate and orthovanadate complexes such as, for example, ammonium metavanadate, sodium metavanadate, and sodium orthovanadate. Suitable vanadyl complexes include, for example, vanadyl acetylacetonate and vanadyl sulfate including vanadyl sulfate hydrates such as vanadyl sulfate  
10 mono- and trihydrates.

Representative examples of tungsten and molybdenum complexes also include oxo complexes. Suitable oxo tungsten complexes include tungstate and tungsten oxide complexes. Suitable tungstate complexes include ammonium tungstate, calcium tungstate, sodium tungstate dihydrate, and tungstic acid. Suitable tungsten oxides include tungsten (IV) oxide and tungsten  
15 (VI) oxide. Suitable oxo molybdenum complexes include molybdate, molybdenum oxide, and molybdenyl complexes. Suitable molybdate complexes include ammonium molybdate and its hydrates, sodium molybdate and its hydrates, and potassium molybdate and its hydrates. Suitable molybdenum oxides include molybdenum (VI) oxide, molybdenum (VI) oxide, and molybdic acid. Suitable molybdenyl complexes include, for example, molybdenyl acetylacetonate. Other suitable  
20 tungsten and molybdenum complexes include hydroxo derivatives derived from, for example, glycerol, tartaric acid, and sugars.

A wide variety of other anti-angiogenic factors may also be utilized within the context of the present invention. Representative examples include platelet factor 4; protamine sulphate; sulphated chitin derivatives (prepared from queen crab shells), (Murata et al., Cancer Res. 51:22-  
25 26, 1991); Sulphated Polysaccharide Peptidoglycan Complex (SP- PG) (the function of this compound may be enhanced by the presence of steroids such as estrogen, and tamoxifen citrate); Staurosporine; modulators of matrix metabolism, including for example, proline analogs, cishydroxyproline, d,L-3,4-dehydroproline, Thiaproline, alpha,alpha-dipyridyl, aminopropionitrile fumarate; 4-propyl-5-(4-pyridinyl)-2(3H)-oxazolone; Methotrexate; Mitoxantrone; Heparin;  
30 Interferons; 2 Macroglobulin-serum; ChIMP-3 (Pavloff et al., J. Bio. Chem. 267:17321-17326, 1992); Chymostatin (Tomkinson et al., Biochem J. 286:475-480, 1992); Cyclodextrin Tetradasulfate; Eponemycin; Camptothecin; Fumagillin (Ingber et al., Nature 348:555-557, 1990); Gold Sodium Thiomalate ("GST"; Matsubara and Ziff, J. Clin. Invest. 79:1440-1446, 1987); anticollagenase-serum; alpha2-antiplasmin (Holmes et al., J. Biol. Chem. 262(4):1659-  
35 1664, 1987); Bisantrene (National Cancer Institute); Lobenzarit disodium (N-(2)-carboxyphenyl-4-chloroanthranilic acid disodium or "CCA"; Takeuchi et al., Agents Actions 36:312-316, 1992);

Thalidomide; Angostatic steroid; AGM-1470; carboxynaminolimidazole; and metalloproteinase inhibitors such as BB94.

#### Diseases at the Cellular Level

5 Diseases associated with increased cell survival or the inhibition of apoptosis that could be detected, prevented, diagnosed, prognosticated, treated, and/or ameliorated using polynucleotides or polypeptides, as well as antagonists or agonists of the present invention, include cancers (such as follicular lymphomas, carcinomas with p53 mutations, and hormone-dependent tumors, including, but not limited to colon cancer, cardiac tumors, pancreatic cancer, 10 melanoma, retinoblastoma, glioblastoma, lung cancer, intestinal cancer, testicular cancer, stomach cancer, neuroblastoma, myxoma, myoma, lymphoma, endothelioma, osteoblastoma, osteoclastoma, osteosarcoma, chondrosarcoma, adenoma, breast cancer, prostate cancer, Kaposi's sarcoma and ovarian cancer); autoimmune disorders (such as, multiple sclerosis, Sjogren's syndrome, Hashimoto's thyroiditis, biliary cirrhosis, Behcet's disease, Crohn's disease, 15 polymyositis, systemic lupus erythematosus and immune-related glomerulonephritis and rheumatoid arthritis) and viral infections (such as herpes viruses, pox viruses and adenoviruses), inflammation, graft v. host disease, acute graft rejection, and chronic graft rejection.

In preferred embodiments, polynucleotides, polypeptides, and/or antagonists of the invention are used to inhibit growth, progression, and/or metasis of cancers, in particular those 20 listed above.

Additional diseases or conditions associated with increased cell survival that could be treated or detected by polynucleotides or polypeptides, or agonists or antagonists of the present invention include, but are not limited to, progression, and/or metastases of malignancies and related disorders such as leukemia (including acute leukemias (e.g., acute lymphocytic leukemia, 25 acute myelocytic leukemia (including myeloblastic, promyelocytic, myelomonocytic, monocytic, and erythroleukemia)) and chronic leukemias (e.g., chronic myelocytic (granulocytic) leukemia and chronic lymphocytic leukemia)), polycythemia vera, lymphomas (e.g., Hodgkin's disease and non-Hodgkin's disease), multiple myeloma, Waldenstrom's macroglobulinemia, heavy chain disease, and solid tumors including, but not limited to, sarcomas and carcinomas such as 30 fibrosarcoma, myxosarcoma, liposarcoma, chondrosarcoma, osteogenic sarcoma, chordoma, angiosarcoma, endotheliosarcoma, lymphangiosarcoma, lymphangioendotheliosarcoma, synovioma, mesothelioma, Ewing's tumor, leiomyosarcoma, rhabdomyosarcoma, colon carcinoma, pancreatic cancer, breast cancer, ovarian cancer, prostate cancer, squamous cell carcinoma, basal cell carcinoma, adenocarcinoma, sweat gland carcinoma, sebaceous gland carcinoma, papillary carcinoma, papillary adenocarcinomas, cystadenocarcinoma, medullary 35 carcinoma, bronchogenic carcinoma, renal cell carcinoma, hepatoma, bile duct carcinoma,

choriocarcinoma, seminoma, embryonal carcinoma, Wilm's tumor, cervical cancer, testicular tumor, lung carcinoma, small cell lung carcinoma, bladder carcinoma, epithelial carcinoma, glioma, astrocytoma, medulloblastoma, craniopharyngioma, ependymoma, pinealoma, hemangioblastoma, acoustic neuroma, oligodendroglioma, meningioma, melanoma, neuroblastoma, and retinoblastoma.

Diseases associated with increased apoptosis that could be detected, prevented, diagnosed, prognosticated, treated, and/or ameliorated using polynucleotides or polypeptides, as well as agonists or antagonists of the present invention, include, but are not limited to, AIDS; neurodegenerative disorders (such as Alzheimer's disease, Parkinson's disease, Amyotrophic lateral sclerosis, Retinitis pigmentosa, Cerebellar degeneration and brain tumor or prior associated disease); autoimmune disorders (such as, multiple sclerosis, Sjogren's syndrome, Hashimoto's thyroiditis, biliary cirrhosis, Behcet's disease, Crohn's disease, polymyositis, systemic lupus erythematosus and immune-related glomerulonephritis and rheumatoid arthritis) myelodysplastic syndromes (such as aplastic anemia), graft v. host disease, ischemic injury (such as that caused by myocardial infarction, stroke and reperfusion injury), liver injury (e.g., hepatitis related liver injury, ischemia/reperfusion injury, cholestasis (bile duct injury) and liver cancer); toxin-induced liver disease (such as that caused by alcohol), septic shock, cachexia and anorexia.

#### Wound Healing and Epithelial Cell Proliferation

In accordance with yet a further aspect of the present invention, there is provided a process for utilizing polynucleotides or polypeptides, as well as agonists or antagonists of the present invention, for therapeutic purposes, for example, to stimulate epithelial cell proliferation and basal keratinocytes for the purpose of wound healing, and to stimulate hair follicle production and healing of dermal wounds. Polynucleotides or polypeptides, as well as agonists or antagonists of the present invention, may be clinically useful in stimulating wound healing including surgical wounds, excisional wounds, deep wounds involving damage of the dermis and epidermis, eye tissue wounds, dental tissue wounds, oral cavity wounds, diabetic ulcers, dermal ulcers, cubitus ulcers, arterial ulcers, venous stasis ulcers, burns resulting from heat exposure or chemicals, and other abnormal wound healing conditions such as uremia, malnutrition, vitamin deficiencies and complications associated with systemic treatment with steroids, radiation therapy and antineoplastic drugs and antimetabolites. Polynucleotides or polypeptides, as well as agonists or antagonists of the present invention, could be used to promote dermal reestablishment subsequent to dermal loss

Polynucleotides or polypeptides, as well as agonists or antagonists of the present invention, could be used to increase the adherence of skin grafts to a wound bed and to stimulate re-epithelialization from the wound bed. The following are types of grafts that polynucleotides or

polypeptides, agonists or antagonists of the present invention, could be used to increase adherence to a wound bed: autografts, artificial skin, allografts, autodermic graft, autoepidermic grafts, avascular grafts, Blair-Brown grafts, bone graft, brephoplastic grafts, cutis graft, delayed graft, dermic graft, epidermic graft, fascia graft, full thickness graft, heterologous graft, xenograft, homologous graft, hyperplastic graft, lamellar graft, mesh graft, mucosal graft, Ollier-Thiersch graft, omentopial graft, patch graft, pedicle graft, penetrating graft, split skin graft, thick split graft. Polynucleotides or polypeptides, as well as agonists or antagonists of the present invention, can be used to promote skin strength and to improve the appearance of aged skin.

It is believed that polynucleotides or polypeptides, as well as agonists or antagonists of the present invention, will also produce changes in hepatocyte proliferation, and epithelial cell proliferation in the lung, breast, pancreas, stomach, small intestine, and large intestine. Polynucleotides or polypeptides, as well as agonists or antagonists of the present invention, could promote proliferation of epithelial cells such as sebocytes, hair follicles, hepatocytes, type II pneumocytes, mucin-producing goblet cells, and other epithelial cells and their progenitors contained within the skin, lung, liver, and gastrointestinal tract. Polynucleotides or polypeptides, agonists or antagonists of the present invention, may promote proliferation of endothelial cells, keratinocytes, and basal keratinocytes.

Polynucleotides or polypeptides, as well as agonists or antagonists of the present invention, could also be used to reduce the side effects of gut toxicity that result from radiation, chemotherapy treatments or viral infections. Polynucleotides or polypeptides, as well as agonists or antagonists of the present invention, may have a cytoprotective effect on the small intestine mucosa. Polynucleotides or polypeptides, as well as agonists or antagonists of the present invention, may also stimulate healing of mucositis (mouth ulcers) that result from chemotherapy and viral infections.

Polynucleotides or polypeptides, as well as agonists or antagonists of the present invention, could further be used in full regeneration of skin in full and partial thickness skin defects, including burns, (i.e., repopulation of hair follicles, sweat glands, and sebaceous glands), treatment of other skin defects such as psoriasis. Polynucleotides or polypeptides, as well as agonists or antagonists of the present invention, could be used to treat epidermolysis bullosa, a defect in adherence of the epidermis to the underlying dermis which results in frequent, open and painful blisters by accelerating reepithelialization of these lesions. Polynucleotides or polypeptides, as well as agonists or antagonists of the present invention, could also be used to treat gastric and duodenal ulcers and help heal by scar formation of the mucosal lining and regeneration of glandular mucosa and duodenal mucosal lining more rapidly. Inflammatory bowel diseases, such as Crohn's disease and ulcerative colitis, are diseases which result in destruction of the mucosal surface of the small or large intestine, respectively. Thus, polynucleotides or

polypeptides, as well as agonists or antagonists of the present invention, could be used to promote the resurfacing of the mucosal surface to aid more rapid healing and to prevent progression of inflammatory bowel disease. Treatment with polynucleotides or polypeptides, agonists or antagonists of the present invention, is expected to have a significant effect on the production of mucus throughout the gastrointestinal tract and could be used to protect the intestinal mucosa from injurious substances that are ingested or following surgery. Polynucleotides or polypeptides, as well as agonists or antagonists of the present invention, could be used to treat diseases associated with the under expression.

Moreover, polynucleotides or polypeptides, as well as agonists or antagonists of the present invention, could be used to prevent and heal damage to the lungs due to various pathological states. Polynucleotides or polypeptides, as well as agonists or antagonists of the present invention, which could stimulate proliferation and differentiation and promote the repair of alveoli and bronchiolar epithelium to prevent or treat acute or chronic lung damage. For example, emphysema, which results in the progressive loss of alveoli, and inhalation injuries, i.e., resulting from smoke inhalation and burns, that cause necrosis of the bronchiolar epithelium and alveoli could be effectively treated using polynucleotides or polypeptides, agonists or antagonists of the present invention. Also, polynucleotides or polypeptides, as well as agonists or antagonists of the present invention, could be used to stimulate the proliferation of and differentiation of type II pneumocytes, which may help treat or prevent disease such as hyaline membrane diseases, such as infant respiratory distress syndrome and bronchopulmonary dysplasia, in premature infants.

Polynucleotides or polypeptides, as well as agonists or antagonists of the present invention, could stimulate the proliferation and differentiation of hepatocytes and, thus, could be used to alleviate or treat liver diseases and pathologies such as fulminant liver failure caused by cirrhosis, liver damage caused by viral hepatitis and toxic substances (i.e., acetaminophen, carbon tetrachloride and other hepatotoxins known in the art).

In addition, polynucleotides or polypeptides, as well as agonists or antagonists of the present invention, could be used to treat or prevent the onset of diabetes mellitus. In patients with newly diagnosed Types I and II diabetes, where some islet cell function remains, polynucleotides or polypeptides, as well as agonists or antagonists of the present invention, could be used to maintain the islet function so as to alleviate, delay or prevent permanent manifestation of the disease. Also, polynucleotides or polypeptides, as well as agonists or antagonists of the present invention, could be used as an auxiliary in islet cell transplantation to improve or promote islet cell function.

#### **Neural Activity and Neurological Diseases**



The polynucleotides, polypeptides and agonists or antagonists of the invention may be used for the detection, prevention, diagnosis, prognostication, treatment, and/or amelioration of diseases, disorders, damage or injury of the brain and/or nervous system. Nervous system disorders that can be treated with the compositions of the invention (e.g., polypeptides, polynucleotides, and/or agonists or antagonists), include, but are not limited to, nervous system injuries, and diseases or disorders which result in either a disconnection of axons, a diminution or degeneration of neurons, or demyelination. Nervous system lesions which may be treated in a patient (including human and non-human mammalian patients) according to the methods of the invention, include but are not limited to, the following lesions of either the central (including spinal cord, brain) or peripheral nervous systems: (1) ischemic lesions, in which a lack of oxygen in a portion of the nervous system results in neuronal injury or death, including cerebral infarction or ischemia, or spinal cord infarction or ischemia; (2) traumatic lesions, including lesions caused by physical injury or associated with surgery, for example, lesions which sever a portion of the nervous system, or compression injuries; (3) malignant lesions, in which a portion of the nervous system is destroyed or injured by malignant tissue which is either a nervous system associated malignancy or a malignancy derived from non-nervous system tissue; (4) infectious lesions, in which a portion of the nervous system is destroyed or injured as a result of infection, for example, by an abscess or associated with infection by human immunodeficiency virus, herpes zoster, or herpes simplex virus or with Lyme disease, tuberculosis, or syphilis; (5) degenerative lesions, in which a portion of the nervous system is destroyed or injured as a result of a degenerative process including but not limited to, degeneration associated with Parkinson's disease, Alzheimer's disease, Huntington's chorea, or amyotrophic lateral sclerosis (ALS); (6) lesions associated with nutritional diseases or disorders, in which a portion of the nervous system is destroyed or injured by a nutritional disorder or disorder of metabolism including, but not limited to, vitamin B12 deficiency, folic acid deficiency, Wernicke disease, tobacco-alcohol amblyopia, Marchiafava-Bignami disease (primary degeneration of the corpus callosum), and alcoholic cerebellar degeneration; (7) neurological lesions associated with systemic diseases including, but not limited to, diabetes (diabetic neuropathy, Bell's palsy), systemic lupus erythematosus, carcinoma, or sarcoidosis; (8) lesions caused by toxic substances including alcohol, lead, or particular neurotoxins; and (9) demyelinated lesions in which a portion of the nervous system is destroyed or injured by a demyelinating disease including, but not limited to, multiple sclerosis, human immunodeficiency virus-associated myelopathy, transverse myelopathy or various etiologies, progressive multifocal leukoencephalopathy, and central pontine myelinolysis.

In one embodiment, the polypeptides, polynucleotides, or agonists or antagonists of the invention are used to protect neural cells from the damaging effects of hypoxia. In a further preferred embodiment, the polypeptides, polynucleotides, or agonists or antagonists of the invention are used to protect neural cells from the damaging effects of cerebral hypoxia.

According to this embodiment, the compositions of the invention are used to treat or prevent neural cell injury associated with cerebral hypoxia. In one non-exclusive aspect of this embodiment, the polypeptides, polynucleotides, or agonists or antagonists of the invention, are used to treat or prevent neural cell injury associated with cerebral ischemia. In another non-exclusive aspect of this embodiment, the polypeptides, polynucleotides, or agonists or antagonists of the invention are used to treat or prevent neural cell injury associated with cerebral infarction.

In another preferred embodiment, the polypeptides, polynucleotides, or agonists or antagonists of the invention are used to treat or prevent neural cell injury associated with a stroke. In a specific embodiment, the polypeptides, polynucleotides, or agonists or antagonists of the invention are used to treat or prevent cerebral neural cell injury associated with a stroke.

In another preferred embodiment, the polypeptides, polynucleotides, or agonists or antagonists of the invention are used to treat or prevent neural cell injury associated with a heart attack. In a specific embodiment, the polypeptides, polynucleotides, or agonists or antagonists of the invention are used to treat or prevent cerebral neural cell injury associated with a heart attack.

The compositions of the invention which are useful for treating or preventing a nervous system disorder may be selected by testing for biological activity in promoting the survival or differentiation of neurons. For example, and not by way of limitation, compositions of the invention which elicit any of the following effects may be useful according to the invention: (1) increased survival time of neurons in culture either in the presence or absence of hypoxia or hypoxic conditions; (2) increased sprouting of neurons in culture or *in vivo*; (3) increased production of a neuron-associated molecule in culture or *in vivo*, e.g., choline acetyltransferase or acetylcholinesterase with respect to motor neurons; or (4) decreased symptoms of neuron dysfunction *in vivo*. Such effects may be measured by any method known in the art. In preferred, non-limiting embodiments, increased survival of neurons may routinely be measured using a method set forth herein or otherwise known in the art, such as, for example, in Zhang *et al.*, *Proc Natl Acad Sci USA* 97:3637-42 (2000) or in Arakawa *et al.*, *J. Neurosci.*, 10:3507-15 (1990); increased sprouting of neurons may be detected by methods known in the art, such as, for example, the methods set forth in Pestronk *et al.*, *Exp. Neurol.*, 70:65-82 (1980), or Brown *et al.*, *Ann. Rev. Neurosci.*, 4:17-42 (1981); increased production of neuron-associated molecules may be measured by bioassay, enzymatic assay, antibody binding, Northern blot assay, etc., using techniques known in the art and depending on the molecule to be measured; and motor neuron dysfunction may be measured by assessing the physical manifestation of motor neuron disorder, e.g., weakness, motor neuron conduction velocity, or functional disability.

In specific embodiments, motor neuron disorders that may be treated according to the invention include, but are not limited to, disorders such as infarction, infection, exposure to toxin, trauma, surgical damage, degenerative disease or malignancy that may affect motor neurons as

well as other components of the nervous system, as well as disorders that selectively affect neurons such as amyotrophic lateral sclerosis, and including, but not limited to, progressive spinal muscular atrophy, progressive bulbar palsy, primary lateral sclerosis, infantile and juvenile muscular atrophy, progressive bulbar paralysis of childhood (Fazio-Londe syndrome),  
5 poliomyelitis and the post polio syndrome, and Hereditary Motorsensory Neuropathy (Charcot-Marie-Tooth Disease).

Further, polypeptides or polynucleotides of the invention may play a role in neuronal survival; synapse formation; conductance; neural differentiation, etc. Thus, compositions of the invention (including polynucleotides, polypeptides, and agonists or antagonists) may be used to  
10 detect, prevent, diagnose, prognosticate, treat, and/or ameliorate diseases or disorders associated with these roles, including, but not limited to, learning and/or cognition disorders. The compositions of the invention may also be useful in the treatment or prevention of neurodegenerative disease states and/or behavioural disorders. Such neurodegenerative disease states and/or behavioral disorders include, but are not limited to, Alzheimer's Disease, Parkinson's  
15 Disease, Huntington's Disease, Tourette Syndrome, schizophrenia, mania, dementia, paranoia, obsessive compulsive disorder, panic disorder, learning disabilities, ALS, psychoses, autism, and altered behaviors, including disorders in feeding, sleep patterns, balance, and perception. In addition, compositions of the invention may also play a role in the treatment, prevention and/or detection of developmental disorders associated with the developing embryo, or sexually-linked  
20 disorders.

Additionally, polypeptides, polynucleotides and/or agonists or antagonists of the invention, may be useful in protecting neural cells from diseases, damage, disorders, or injury, associated with cerebrovascular disorders including, but not limited to, carotid artery diseases (e.g., carotid artery thrombosis, carotid stenosis, or Moyamoya Disease), cerebral amyloid  
25 angiopathy, cerebral aneurysm, cerebral anoxia, cerebral arteriosclerosis, cerebral arteriovenous malformations, cerebral artery diseases, cerebral embolism and thrombosis (e.g., carotid artery thrombosis, sinus thrombosis, or Wallenberg's Syndrome), cerebral hemorrhage (e.g., epidural or subdural hematoma, or subarachnoid hemorrhage), cerebral infarction, cerebral ischemia (e.g., transient cerebral ischemia, Subclavian Steal Syndrome, or vertebrobasilar insufficiency), vascular  
30 dementia (e.g., multi-infarct), leukomalacia, periventricular, and vascular headache (e.g., cluster headache or migraines).

In accordance with yet a further aspect of the present invention, there is provided a process for utilizing polynucleotides or polypeptides, as well as agonists or antagonists of the present invention, for therapeutic purposes, for example, to stimulate neurological cell  
35 proliferation and/or differentiation. Therefore, polynucleotides, polypeptides, agonists and/or antagonists of the invention may be used to treat and/or detect neurologic diseases. Moreover,

polynucleotides or polypeptides, or agonists or antagonists of the invention, can be used as a marker or detector of a particular nervous system disease or disorder.

5 Examples of neurologic diseases which can be treated or detected with polynucleotides, polypeptides, agonists, and/or antagonists of the present invention include brain diseases, such as metabolic brain diseases which includes phenylketonuria such as maternal phenylketonuria, pyruvate carboxylase deficiency, pyruvate dehydrogenase complex deficiency, Wernicke's Encephalopathy, brain edema, brain neoplasms such as cerebellar neoplasms which include infratentorial neoplasms, cerebral ventricle neoplasms such as choroid plexus neoplasms, hypothalamic neoplasms, supratentorial neoplasms, canavan disease, cerebellar diseases such as cerebellar ataxia which include spinocerebellar degeneration such as ataxia telangiectasia, cerebellar dysynergia, Friederich's Ataxia, Machado-Joseph Disease, olivopontocerebellar atrophy, cerebellar neoplasms such as infratentorial neoplasms, diffuse cerebral sclerosis such as encephalitis periaxialis, globoid cell leukodystrophy, metachromatic leukodystrophy and subacute sclerosing panencephalitis.

15 Additional neurologic diseases which can be treated or detected with polynucleotides, polypeptides, agonists, and/or antagonists of the present invention include cerebrovascular disorders (such as carotid artery diseases which include carotid artery thrombosis, carotid stenosis and Moyamoya Disease), cerebral amyloid angiopathy, cerebral aneurysm, cerebral anoxia, cerebral arteriosclerosis, cerebral arteriovenous malformations, cerebral artery diseases, cerebral embolism and thrombosis such as carotid artery thrombosis, sinus thrombosis and Wallenberg's Syndrome, cerebral hemorrhage such as epidural hematoma, subdural hematoma and subarachnoid hemorrhage, cerebral infarction, cerebral ischemia such as transient cerebral ischemia, Subclavian Steal Syndrome and vertebrobasilar insufficiency, vascular dementia such as multi-infarct dementia, periventricular leukomalacia, vascular headache such as cluster headache and migraine.

25 Additional neurologic diseases which can be treated or detected with polynucleotides, polypeptides, agonists, and/or antagonists of the present invention include dementia such as AIDS Dementia Complex, presenile dementia such as Alzheimer's Disease and Creutzfeldt-Jakob Syndrome, senile dementia such as Alzheimer's Disease and progressive supranuclear palsy, vascular dementia such as multi-infarct dementia, encephalitis which include encephalitis periaxialis, viral encephalitis such as epidemic encephalitis, Japanese Encephalitis, St. Louis Encephalitis, tick-borne encephalitis and West Nile Fever, acute disseminated encephalomyelitis, meningoencephalitis such as uveomeningoencephalitic syndrome, Postencephalitic Parkinson Disease and subacute sclerosing panencephalitis, encephalomalacia such as periventricular leukomalacia, epilepsy such as generalized epilepsy which includes infantile spasms, absence epilepsy, myoclonic epilepsy which includes MERRF Syndrome, tonic-clonic epilepsy, partial epilepsy such as complex partial epilepsy, frontal lobe epilepsy and temporal lobe epilepsy, post-

traumatic epilepsy, status epilepticus such as Epilepsia Partialis Continua, and Hallervorden-Spatz Syndrome.

Additional neurologic diseases which can be treated or detected with polynucleotides, polypeptides, agonists, and/or antagonists of the present invention include hydrocephalus such as  
5 Dandy-Walker Syndrome and normal pressure hydrocephalus, hypothalamic diseases such as hypothalamic neoplasms, cerebral malaria, narcolepsy which includes cataplexy, bulbar poliomyelitis, cerebri pseudotumor, Rett Syndrome, Reye's Syndrome, thalamic diseases, cerebral toxoplasmosis, intracranial tuberculoma and Zellweger Syndrome, central nervous system  
10 infections such as AIDS Dementia Complex, Brain Abscess, subdural empyema, encephalomyelitis such as Equine Encephalomyelitis, Venezuelan Equine Encephalomyelitis, Necrotizing Hemorrhagic Encephalomyelitis, Visna, and cerebral malaria.

Additional neurologic diseases which can be treated or detected with polynucleotides, polypeptides, agonists, and/or antagonists of the present invention include meningitis such as  
15 arachnoiditis, aseptic meningitis such as viral meningitis which includes lymphocytic choriomeningitis, Bacterial meningitis which includes Haemophilus Meningitis, Listeria Meningitis, Meningococcal Meningitis such as Waterhouse-Friderichsen Syndrome, Pneumococcal Meningitis and meningeal tuberculosis, fungal meningitis such as Cryptococcal Meningitis, subdural effusion, meningoencephalitis such as uvemeningoencephalitic syndrome, myelitis such as transverse myelitis, neurosyphilis such as tabes dorsalis, poliomyelitis which  
20 includes bulbar poliomyelitis and postpoliomyelitis syndrome, prion diseases (such as Creutzfeldt-Jakob Syndrome, Bovine Spongiform Encephalopathy, Gerstmann-Straussler Syndrome, Kuru, Scrapie), and cerebral toxoplasmosis.

Additional neurologic diseases which can be treated or detected with polynucleotides, polypeptides, agonists, and/or antagonists of the present invention include central nervous system  
25 neoplasms such as brain neoplasms that include cerebellar neoplasms such as infratentorial neoplasms, cerebral ventricle neoplasms such as choroid plexus neoplasms, hypothalamic neoplasms and supratentorial neoplasms, meningeal neoplasms, spinal cord neoplasms which include epidural neoplasms, demyelinating diseases such as Canavan Diseases, diffuse cerebral  
30 sclerol which includes adrenoleukodystrophy, encephalitis periaxialis, globoid cell leukodystrophy, diffuse cerebral sclerosis such as metachromatic leukodystrophy, allergic encephalomyelitis, necrotizing hemorrhagic encephalomyelitis, progressive multifocal leukoencephalopathy, multiple sclerosis, central pontine myelinolysis, transverse myelitis, neuromyelitis optica, Scrapie, Swayback, Chronic Fatigue Syndrome, Visna, High Pressure  
35 Nervous Syndrome, Meningism, spinal cord diseases such as amyotonia congenita, amyotrophic lateral sclerosis, spinal muscular atrophy such as Werdnig-Hoffmann Disease, spinal cord compression, spinal cord neoplasms such as epidural neoplasms, syringomyelia, Tabes Dorsalis,

Stiff-Man Syndrome, mental retardation such as Angelman Syndrome, Cri-du-Chat Syndrome, De Lange's Syndrome, Down Syndrome, Gangliosidoses such as gangliosidoses G(M1), Sandhoff Disease, Tay-Sachs Disease, Hartnup Disease, homocystinuria, Laurence-Moon- Biedl Syndrome, Lesch-Nyhan Syndrome, Maple Syrup Urine Disease, mucopolipidosis such as fucosidosis, neuronal ceroid-lipofuscinosis, oculocerebrorenal syndrome, phenylketonuria such as maternal phenylketonuria, Prader-Willi Syndrome, Rett Syndrome, Rubinstein-Taybi Syndrome, Tuberous Sclerosis, WAGR Syndrome, nervous system abnormalities such as holoprosencephaly, neural tube defects such as anencephaly which includes hydrangencephaly, Arnold-Chairi Deformity, encephalocele, meningocele, meningomyelocele, spinal dysraphism such as spina bifida cystica and spina bifida occulta.

Additional neurologic diseases which can be treated or detected with polynucleotides, polypeptides, agonists, and/or antagonists of the present invention include hereditary motor and sensory neuropathies which include Charcot-Marie Disease, Hereditary optic atrophy, Refsum's Disease, hereditary spastic paraplegia, Werdnig-Hoffmann Disease, Hereditary Sensory and Autonomic Neuropathies such as Congenital Analgesia and Familial Dysautonomia, Neurologic manifestations (such as agnosia that include Gerstmann's Syndrome, Amnesia such as retrograde amnesia, apraxia, neurogenic bladder, cataplexy, communicative disorders such as hearing disorders that includes deafness, partial hearing loss, loudness recruitment and tinnitus, language disorders such as aphasia which include agraphia, anomia, broca aphasia, and Wernicke Aphasia, Dyslexia such as Acquired Dyslexia, language development disorders, speech disorders such as aphasia which includes anomia, broca aphasia and Wernicke Aphasia, articulation disorders, communicative disorders such as speech disorders which include dysarthria, echolalia, mutism and stuttering, voice disorders such as aphonia and hoarseness, decerebrate state, delirium, fasciculation, hallucinations, meningism, movement disorders such as angelman syndrome, ataxia, athetosis, chorea, dystonia, hypokinesia, muscle hypotonia, myoclonus, tic, torticollis and tremor, muscle hypertonia such as muscle rigidity such as stiff-man syndrome, muscle spasticity, paralysis such as facial paralysis which includes Herpes Zoster Oticus, Gastroparesis, Hemiplegia, ophthalmoplegia such as diplopia, Duane's Syndrome, Horner's Syndrome, Chronic progressive external ophthalmoplegia such as Kearns Syndrome, Bulbar Paralysis, Tropical Spastic Paraparesis, Paraplegia such as Brown-Sequard Syndrome, quadriplegia, respiratory paralysis and vocal cord paralysis, paresis, phantom limb, taste disorders such as ageusia and dysgeusia, vision disorders such as amblyopia, blindness, color vision defects, diplopia, hemianopsia, scotoma and subnormal vision, sleep disorders such as hypersomnia which includes Kleine-Levin Syndrome, insomnia, and somnambulism, spasm such as trismus, unconsciousness such as coma, persistent vegetative state and syncope and vertigo, neuromuscular diseases such as amyotonia congenita, amyotrophic lateral sclerosis, Lambert-Eaton Myasthenic Syndrome, motor neuron disease, muscular atrophy such as spinal muscular atrophy, Charcot-Marie Disease and Werdnig-Hoffmann

Disease, Postpoliomyelitis Syndrome, Muscular Dystrophy, Myasthenia Gravis, Myotonia Atrophica, Myotonia Confenita, Nemaline Myopathy, Familial Periodic Paralysis, Multiplex Paramyoclonus, Tropical Spastic Paraparesis and Stiff-Man Syndrome, peripheral nervous system diseases such as acrodynia, amyloid neuropathies, autonomic nervous system diseases such as

5 Adie's Syndrome, Barre-Lieou Syndrome, Familial Dysautonomia, Horner's Syndrome, Reflex Sympathetic Dystrophy and Shy-Drager Syndrome, Cranial Nerve Diseases such as Acoustic Nerve Diseases such as Acoustic Neuroma which includes Neurofibromatosis 2, Facial Nerve Diseases such as Facial Neuralgia, Melkersson-Rosenthal Syndrome, ocular motility disorders which includes amblyopia, nystagmus, oculomotor nerve paralysis, ophthalmoplegia such as

10 Duane's Syndrome, Horner's Syndrome, Chronic Progressive External Ophthalmoplegia which includes Kearns Syndrome, Strabismus such as Esotropia and Exotropia, Oculomotor Nerve Paralysis, Optic Nerve Diseases such as Optic Atrophy which includes Hereditary Optic Atrophy, Optic Disk Drusen, Optic Neuritis such as Neuromyelitis Optica, Papilledema, Trigeminal Neuralgia, Vocal Cord Paralysis, Demyelinating Diseases such as Neuromyelitis Optica and

15 Swayback, and Diabetic neuropathies such as diabetic foot.

Additional neurologic diseases which can be treated or detected with polynucleotides, polypeptides, agonists, and/or antagonists of the present invention include nerve compression syndromes such as carpal tunnel syndrome, tarsal tunnel syndrome, thoracic outlet syndrome such as cervical rib syndrome, ulnar nerve compression syndrome, neuralgia such as causalgia, cervico-

20 brachial neuralgia, facial neuralgia and trigeminal neuralgia, neuritis such as experimental allergic neuritis, optic neuritis, polyneuritis, polyradiculoneuritis and radiculitis such as polyradiculitis, hereditary motor and sensory neuropathies such as Charcot-Marie Disease, Hereditary Optic Atrophy, Refsum's Disease, Hereditary Spastic Paraplegia and Werdnig-Hoffmann Disease, Hereditary Sensory and Autonomic Neuropathies which include Congenital Analgesia and

25 Familial Dysautonomia, POEMS Syndrome, Sciatica, Gustatory Sweating and Tetany).

#### **Endocrine Disorders**

Polynucleotides or polypeptides, or agonists or antagonists of the present invention, may be used to detect, prevent, diagnose, prognosticate, treat, and/or ameliorate disorders and/or

30 diseases related to hormone imbalance, and/or disorders or diseases of the endocrine system.

Hormones secreted by the glands of the endocrine system control physical growth, sexual function, metabolism, and other functions. Disorders may be classified in two ways: disturbances in the production of hormones, and the inability of tissues to respond to hormones. The etiology of these hormone imbalance or endocrine system diseases, disorders or conditions

35 may be genetic, somatic, such as cancer and some autoimmune diseases, acquired (e.g., by chemotherapy, injury or toxins), or infectious. Moreover, polynucleotides, polypeptides,

antibodies, and/or agonists or antagonists of the present invention can be used as a marker or detector of a particular disease or disorder related to the endocrine system and/or hormone imbalance.

5       Endocrine system and/or hormone imbalance and/or diseases encompass disorders of uterine motility including, but not limited to: complications with pregnancy and labor (e.g., pre-term labor, post-term pregnancy, spontaneous abortion, and slow or stopped labor); and disorders and/or diseases of the menstrual cycle (e.g., dysmenorrhea and endometriosis).

10       Endocrine system and/or hormone imbalance disorders and/or diseases include disorders and/or diseases of the pancreas, such as, for example, diabetes mellitus, diabetes insipidus, congenital pancreatic agenesis, pheochromocytoma-islet cell tumor syndrome; disorders and/or diseases of the adrenal glands such as, for example, Addison's Disease, corticosteroid deficiency, virilizing disease, hirsutism, Cushing's Syndrome, hyperaldosteronism, pheochromocytoma; disorders and/or diseases of the pituitary gland, such as, for example, hyperpituitarism, hypopituitarism, pituitary dwarfism, pituitary adenoma, panhypopituitarism, acromegaly, gigantism; disorders and/or diseases of the thyroid, including but not limited to, hyperthyroidism, hypothyroidism, Plummer's disease, Graves' disease (toxic diffuse goiter), toxic nodular goiter, thyroiditis (Hashimoto's thyroiditis, subacute granulomatous thyroiditis, and silent lymphocytic thyroiditis), Pendred's syndrome, myxedema, cretinism, thyrotoxicosis, thyroid hormone coupling defect, thymic aplasia, Hurthle cell tumours of the thyroid, thyroid cancer, 20 thyroid carcinoma, Medullary thyroid carcinoma; disorders and/or diseases of the parathyroid, such as, for example, hyperparathyroidism, hypoparathyroidism; disorders and/or diseases of the hypothalamus.

25       In addition, endocrine system and/or hormone imbalance disorders and/or diseases may also include disorders and/or diseases of the testes or ovaries, including cancer. Other disorders and/or diseases of the testes or ovaries further include, for example, ovarian cancer, polycystic ovary syndrome, Klinefelter's syndrome, vanishing testes syndrome (bilateral anorchia), congenital absence of Leydig's cells, cryptorchidism, Noonan's syndrome, myotonic dystrophy, capillary haemangioma of the testis (benign), neoplasias of the testis and neo-testis.

30       Moreover, endocrine system and/or hormone imbalance disorders and/or diseases may also include disorders and/or diseases such as, for example, polyglandular deficiency syndromes, pheochromocytoma, neuroblastoma, multiple Endocrine neoplasia, and disorders and/or cancers of endocrine tissues.

35       In another embodiment, a polypeptide of the invention, or polynucleotides, antibodies, agonists, or antagonists corresponding to that polypeptide, may be used to detect, prevent, diagnose, prognosticate, treat, and/or ameliorate endocrine diseases and/or disorders associated



with the tissue(s) in which the polypeptide of the invention is expressed, including one, two, three, four, five, or more tissues disclosed in Table 1B.2, column 5 (Tissue Distribution Library Code).

## 5 **Reproductive System Disorders**

The polynucleotides or polypeptides, or agonists or antagonists of the invention may be used for the detection, prevention, diagnosis, prognostication, treatment, and/or amelioration of diseases and/or disorders of the reproductive system. Reproductive system disorders that can be treated by the compositions of the invention, include, but are not limited to, reproductive system  
10 injuries, infections, neoplastic disorders, congenital defects, and diseases or disorders which result in infertility, complications with pregnancy, labor, or parturition, and postpartum difficulties.

Reproductive system disorders and/or diseases include diseases and/or disorders of the testes, including testicular atrophy, testicular feminization, cryptorchism (unilateral and bilateral), anorchia, ectopic testis, epididymitis and orchitis (typically resulting from infections such as, for  
15 example, gonorrhea, mumps, tuberculosis, and syphilis), testicular torsion, vasitis nodosa, germ cell tumors (e.g., seminomas, embryonal cell carcinomas, teratocarcinomas, choriocarcinomas, yolk sac tumors, and teratomas), stromal tumors (e.g., Leydig cell tumors), hydrocele, hematocele, varicocele, spermatocele, inguinal hernia, and disorders of sperm production (e.g., immotile cilia syndrome, aspermia, asthenozoospermia, azoospermia, oligospermia, and teratozoospermia).

Reproductive system disorders also include disorders of the prostate gland, such as acute non-bacterial prostatitis, chronic non-bacterial prostatitis, acute bacterial prostatitis, chronic bacterial prostatitis, prostatodystonia, prostatosis, granulomatous prostatitis, malacoplakia, benign prostatic hypertrophy or hyperplasia, and prostate neoplastic disorders, including  
20 adenocarcinomas, transitional cell carcinomas, ductal carcinomas, and squamous cell carcinomas.

Additionally, the compositions of the invention may be useful in the detection, prevention, diagnosis, prognostication, treatment, and/or amelioration of disorders or diseases of the penis and urethra, including inflammatory disorders, such as balanoposthitis, balanitis xerotica obliterans, phimosis, paraphimosis, syphilis, herpes simplex virus, gonorrhea, non-gonococcal urethritis, chlamydia, mycoplasma, trichomonas, HIV, AIDS, Reiter's syndrome, condyloma  
25 acuminatum, condyloma latum, and pearly penile papules; urethral abnormalities, such as hypospadias, epispadias, and phimosis; premalignant lesions, including Erythroplasia of Queyrat, Bowen's disease, Bowenoid paplosis, giant condyloma of Buscke-Lowenstein, and verrucous carcinoma; penile cancers, including squamous cell carcinomas, carcinoma in situ, verrucous carcinoma, and disseminated penile carcinoma; urethral neoplastic disorders, including penile  
30 urethral carcinoma, bulbomembranous urethral carcinoma, and prostatic urethral carcinoma; and erectile disorders, such as priapism, Peyronie's disease, erectile dysfunction, and impotence.

Moreover, diseases and/or disorders of the vas deferens include vasculitis and CBAVD (congenital bilateral absence of the vas deferens); additionally, the polynucleotides, polypeptides, and agonists or antagonists of the present invention may be used in the detection, prevention, diagnosis, prognostication, treatment, and/or amelioration of diseases and disorders of the seminal vesicles, including hydatid disease, congenital chloride diarrhea, and polycystic kidney disease.

Other disorders and/or diseases of the male reproductive system include, for example, Klinefelter's syndrome, Young's syndrome, premature ejaculation, diabetes mellitus, cystic fibrosis, Kartagener's syndrome, high fever, multiple sclerosis, and gynecomastia.

Further, the polynucleotides, polypeptides, and agonists or antagonists of the present invention may be used in the detection, prevention, diagnosis, prognostication, treatment, and/or amelioration of diseases and/or disorders of the vagina and vulva, including bacterial vaginosis, candida vaginitis, herpes simplex virus, chancroid, granuloma inguinale, lymphogranuloma venereum, scabies, human papillomavirus, vaginal trauma, vulvar trauma, adenositis, chlamydia vaginitis, gonorrhea, trichomonas vaginitis, condyloma acuminatum, syphilis, molluscum contagiosum, atrophic vaginitis, Paget's disease, lichen sclerosus, lichen planus, vulvodynia, toxic shock syndrome, vaginismus, vulvovaginitis, vulvar vestibulitis, and neoplastic disorders, such as squamous cell hyperplasia, clear cell carcinoma, basal cell carcinoma, melanomas, cancer of Bartholin's gland, and vulvar intraepithelial neoplasia.

Disorders and/or diseases of the uterus include dysmenorrhea, retroverted uterus, endometriosis, fibroids, adenomyosis, anovulatory bleeding, amenorrhea, Cushing's syndrome, hydatidiform moles, Asherman's syndrome, premature menopause, precocious puberty, uterine polyps, dysfunctional uterine bleeding (e.g., due to aberrant hormonal signals), and neoplastic disorders, such as adenocarcinomas, leiomyosarcomas, and sarcomas. Additionally, the polypeptides, polynucleotides, or agonists or antagonists of the invention may be useful as a marker or detector of, as well as in the detection, prevention, diagnosis, prognostication, treatment, and/or amelioration of congenital uterine abnormalities, such as bicornuate uterus, septate uterus, simple unicornuate uterus, unicornuate uterus with a noncavitary rudimentary horn, unicornuate uterus with a non-communicating cavitary rudimentary horn, unicornuate uterus with a communicating cavitary horn, arcuate uterus, uterine didelphys, and T-shaped uterus.

Ovarian diseases and/or disorders include anovulation, polycystic ovary syndrome (Stein-Leventhal syndrome), ovarian cysts, ovarian hypofunction, ovarian insensitivity to gonadotropins, ovarian overproduction of androgens, right ovarian vein syndrome, amenorrhea, hirsutism, and ovarian cancer (including, but not limited to, primary and secondary cancerous growth, Sertoli-Leydig tumors, endometrioid carcinoma of the ovary, ovarian papillary serous adenocarcinoma, ovarian mucinous adenocarcinoma, and Ovarian Krukenberg tumors).

Cervical diseases and/or disorders include cervicitis, chronic cervicitis, mucopurulent cervicitis, cervical dysplasia, cervical polyps, Nabothian cysts, cervical erosion, cervical incompetence, and cervical neoplasms (including, for example, cervical carcinoma, squamous metaplasia, squamous cell carcinoma, adenosquamous cell neoplasia, and columnar cell neoplasia).

5 Additionally, diseases and/or disorders of the reproductive system include disorders and/or diseases of pregnancy, including miscarriage and stillbirth, such as early abortion, late abortion, spontaneous abortion, induced abortion, therapeutic abortion, threatened abortion, missed abortion, incomplete abortion, complete abortion, habitual abortion, missed abortion, and septic  
10 abortion; ectopic pregnancy, anemia, Rh incompatibility, vaginal bleeding during pregnancy, gestational diabetes, intrauterine growth retardation, polyhydramnios, HELLP syndrome, abruptio placentae, placenta previa, hyperemesis, preeclampsia, eclampsia, herpes gestationis, and urticaria of pregnancy. Additionally, the polynucleotides, polypeptides, and agonists or antagonists of the present invention may be used in the detection, prevention, diagnosis, prognostication, treatment,  
15 and/or amelioration of diseases that can complicate pregnancy, including heart disease, heart failure, rheumatic heart disease, congenital heart disease, mitral valve prolapse, high blood pressure, anemia, kidney disease, infectious disease (e.g., rubella, cytomegalovirus, toxoplasmosis, infectious hepatitis, chlamydia, HIV, AIDS, and genital herpes), diabetes mellitus, Graves' disease, thyroiditis, hypothyroidism, Hashimoto's thyroiditis, chronic active hepatitis, cirrhosis of  
20 the liver, primary biliary cirrhosis, asthma, systemic lupus eryematositis, rheumatoid arthritis, myasthenia gravis, idiopathic thrombocytopenic purpura, appendicitis, ovarian cysts, gallbladder disorders, and obstruction of the intestine.

Complications associated with labor and parturition include premature rupture of the membranes, pre-term labor, post-term pregnancy, postmaturity, labor that progresses too slowly,  
25 fetal distress (e.g., abnormal heart rate (fetal or maternal), breathing problems, and abnormal fetal position), shoulder dystocia, prolapsed umbilical cord, amniotic fluid embolism, and aberrant uterine bleeding.

Further, diseases and/or disorders of the postdelivery period, including endometritis, myometritis, parametritis, peritonitis, pelvic thrombophlebitis, pulmonary embolism, endotoxemia,  
30 pyelonephritis, saphenous thrombophlebitis, mastitis, cystitis, postpartum hemorrhage, and inverted uterus.

Other disorders and/or diseases of the female reproductive system that may be detected, prevented, diagnosed, prognosticated, treated, and/or ameliorated by the polynucleotides, polypeptides, and agonists or antagonists of the present invention include, for example, Turner's  
35 syndrome, pseudohermaphroditism, premenstrual syndrome, pelvic inflammatory disease, pelvic

congestion (vascular engorgement), frigidity, anorgasmia, dyspareunia, ruptured fallopian tube, and Mittelschmerz.

### Infectious Disease

5 Polynucleotides or polypeptides, as well as agonists or antagonists of the present invention can be used to treat or detect infectious agents. For example, by increasing the immune response, particularly increasing the proliferation and differentiation of B and/or T cells, infectious diseases may be treated. The immune response may be increased by either enhancing an existing immune response, or by initiating a new immune response. Alternatively, polynucleotides or  
10 polypeptides, as well as agonists or antagonists of the present invention may also directly inhibit the infectious agent, without necessarily eliciting an immune response.

Viruses are one example of an infectious agent that can cause disease or symptoms that can be treated or detected by a polynucleotide or polypeptide and/or agonist or antagonist of the present invention. Examples of viruses, include, but are not limited to Examples of viruses,  
15 include, but are not limited to the following DNA and RNA viruses and viral families: Arbovirus, Adenoviridae, Arenaviridae, Arterivirus, Birnaviridae, Bunyaviridae, Caliciviridae, Circoviridae, Coronaviridae, Dengue, EBV, HIV, Flaviviridae, Hepadnaviridae (Hepatitis), Herpesviridae (such as, Cytomegalovirus, Herpes Simplex, Herpes Zoster), Mononegavirus (e.g., Paramyxoviridae, Morbillivirus, Rhabdoviridae), Orthomyxoviridae (e.g., Influenza A, Influenza B, and parainfluenza), Papilloma virus, Papovaviridae, Parvoviridae, Picomaviridae, Poxviridae (such as Smallpox or Vaccinia), Reoviridae (e.g., Rotavirus), Retroviridae (HTLV-I, HTLV-II, Lentivirus), and Togaviridae (e.g., Rubivirus). Viruses falling within these families can cause a variety of diseases or symptoms, including, but not limited to: arthritis, bronchiolitis, respiratory syncytial virus, encephalitis, eye infections (e.g., conjunctivitis, keratitis), chronic fatigue syndrome,  
20 hepatitis (A, B, C, E, Chronic Active, Delta), Japanese B encephalitis, Junin, Chikungunya, Rift Valley fever, yellow fever, meningitis, opportunistic infections (e.g., AIDS), pneumonia, Burkitt's Lymphoma, chickenpox, hemorrhagic fever, Measles, Mumps, Parainfluenza, Rabies, the common cold, Polio, leukemia, Rubella, sexually transmitted diseases, skin diseases (e.g., Kaposi's, warts), and viremia. polynucleotides or polypeptides, or agonists or antagonists of the invention, can be  
25 used to treat or detect any of these symptoms or diseases. In specific embodiments, polynucleotides, polypeptides, or agonists or antagonists of the invention are used to treat: meningitis, Dengue, EBV, and/or hepatitis (e.g., hepatitis B). In an additional specific embodiment polynucleotides, polypeptides, or agonists or antagonists of the invention are used to treat patients nonresponsive to one or more other commercially available hepatitis vaccines. In a  
30 further specific embodiment polynucleotides, polypeptides, or agonists or antagonists of the invention are used to treat AIDS.

Similarly, bacterial and fungal agents that can cause disease or symptoms and that can be treated or detected by a polynucleotide or polypeptide and/or agonist or antagonist of the present invention include, but not limited to, the following Gram-Negative and Gram-positive bacteria, bacterial families, and fungi: Actinomyces (e.g., Norcardia), Acinetobacter, 5 *Cryptococcus neoformans*, Aspergillus, Bacillaceae (e.g., *Bacillus anthraxis*), Bacteroides (e.g., *Bacteroides fragilis*), Blastomycosis, Bordetella, Borrelia (e.g., *Borrelia burgdorferi*), Brucella, Candidia, Campylobacter, Chlamydia, Clostridium (e.g., *Clostridium botulinum*, *Clostridium difficile*, *Clostridium perfringens*, *Clostridium tetani*), Coccidioides, Corynebacterium (e.g., *Corynebacterium diphtheriae*), Cryptococcus, Dermatocycoses, *E. coli* (e.g., Enterotoxigenic *E. coli* and Enterohemorrhagic *E. coli*), Enterobacter (e.g. *Enterobacter aerogenes*), 10 Enterobacteriaceae (Klebsiella, Salmonella (e.g., *Salmonella typhi*, *Salmonella enteritidis*, *Salmonella typhi*), Serratia, Yersinia, Shigella), Erysipelothrix, Haemophilus (e.g., *Haemophilus influenza* type B), Helicobacter, Legionella (e.g., *Legionella pneumophila*), Leptospira, Listeria (e.g., *Listeria monocytogenes*), Mycoplasma, Mycobacterium (e.g., *Mycobacterium leprae* and 15 *Mycobacterium tuberculosis*), Vibrio (e.g., *Vibrio cholerae*), Neisseriaceae (e.g., *Neisseria gonorrhea*, *Neisseria meningitidis*), Pasteurellaceae, Proteus, Pseudomonas (e.g., *Pseudomonas aeruginosa*), Rickettsiaceae, Spirochetes (e.g., Treponema spp., Leptospira spp., Borrelia spp.), Shigella spp., Staphylococcus (e.g., *Staphylococcus aureus*), Meningioccus, Pneumococcus and Streptococcus (e.g., *Streptococcus pneumoniae* and Groups A, B, and C Streptococci), and 20 Ureaplasmas. These bacterial, parasitic, and fungal families can cause diseases or symptoms, including, but not limited to: antibiotic-resistant infections, bacteremia, endocarditis, septicemia, eye infections (e.g., conjunctivitis), uveitis, tuberculosis, gingivitis, bacterial diarrhea, opportunistic infections (e.g., AIDS related infections), paronychia, prosthesis-related infections, dental caries, Reiter's Disease, respiratory tract infections, such as Whooping Cough or Empyema, 25 sepsis, Lyme Disease, Cat-Scratch Disease, dysentery, paratyphoid fever, food poisoning, Legionella disease, chronic and acute inflammation, erythema, yeast infections, typhoid, pneumonia, gonorrhea, meningitis (e.g., meningitis types A and B), chlamydia, syphilis, diphtheria, leprosy, brucellosis, peptic ulcers, anthrax, spontaneous abortions, birth defects, pneumonia, lung infections, ear infections, deafness, blindness, lethargy, malaise, vomiting, chronic diarrhea, 30 Crohn's disease, colitis, vaginosis, sterility, pelvic inflammatory diseases, candidiasis, paratuberculosis, tuberculosis, lupus, botulism, gangrene, tetanus, impetigo, Rheumatic Fever, Scarlet Fever, sexually transmitted diseases, skin diseases (e.g., cellulitis, dermatocycoses), toxemia, urinary tract infections, wound infections, noscomial infections. Polynucleotides or polypeptides, agonists or antagonists of the invention, can be used to treat or detect any of these 35 symptoms or diseases. In specific embodiments, polynucleotides, polypeptides, agonists or antagonists of the invention are used to treat: tetanus, diphtheria, botulism, and/or meningitis type B.

Moreover, parasitic agents causing disease or symptoms that can be detected, prevented, diagnosed, prognosticated, treated, and/or ameliorated by a polynucleotide or polypeptide and/or agonist or antagonist of the present invention include, but not limited to, the following families or class: Amebiasis, Babesiosis, Coccidiosis, Cryptosporidiosis, 5 Dientamoebiasis, Dourine, Ectoparasitic, Giardiasis, Helminthiasis, Leishmaniasis, Schistosoma, Theileriasis, Toxoplasmosis, Trypanosomiasis, and Trichomonas and Sporozoans (e.g., *Plasmodium virax*, *Plasmodium falciparum*, *Plasmodium malariae* and *Plasmodium ovale*). These parasites can cause a variety of diseases or symptoms, including, but not limited to: 10 Scabies, Trombiculiasis, eye infections, intestinal disease (e.g., dysentery, giardiasis), liver disease, lung disease, opportunistic infections (e.g., AIDS related), malaria, pregnancy complications, and toxoplasmosis. polynucleotides or polypeptides, or agonists or antagonists of the invention, can be used to detect, prevent, diagnose, prognosticate, treat, and/or ameliorate any of these symptoms or diseases. In specific embodiments, polynucleotides, polypeptides, or 15 agonists or antagonists of the invention are used to detect, prevent, diagnose, treat, and/or ameliorate malaria.

Polynucleotides or polypeptides, as well as agonists or antagonists of the present invention of the present invention could either be by administering an effective amount of a polypeptide to the patient, or by removing cells from the patient, supplying the cells with a polynucleotide of the present invention, and returning the engineered cells to the patient (ex vivo 20 therapy). Moreover, the polypeptide or polynucleotide of the present invention can be used as an antigen in a vaccine to raise an immune response against infectious disease.

### **Regeneration**

Polynucleotides or polypeptides, as well as agonists or antagonists of the present invention can be used to differentiate, proliferate, and attract cells, leading to the regeneration of 25 tissues. (See, Science 276:59-87 (1997)). The regeneration of tissues could be used to repair, replace, or protect tissue damaged by congenital defects, trauma (wounds, burns, incisions, or ulcers), age, disease (e.g. osteoporosis, osteoarthritis, periodontal disease, liver failure), surgery, including cosmetic plastic surgery, fibrosis, reperfusion injury, or systemic cytokine damage.

30 Tissues that could be regenerated using the present invention include organs (e.g., pancreas, liver, intestine, kidney, skin, endothelium), muscle (smooth, skeletal or cardiac), vasculature (including vascular and lymphatics), nervous, hematopoietic, and skeletal (bone, cartilage, tendon, and ligament) tissue. Preferably, regeneration occurs without or decreased scarring. Regeneration also may include angiogenesis.

35 Moreover, polynucleotides or polypeptides, as well as agonists or antagonists of the present invention, may increase regeneration of tissues difficult to heal. For example, increased

tendon/ligament regeneration would quicken recovery time after damage. Polynucleotides or polypeptides, as well as agonists or antagonists of the present invention could also be used prophylactically in an effort to avoid damage. Specific diseases that could be treated include of tendinitis, carpal tunnel syndrome, and other tendon or ligament defects. A further example of

5 tissue regeneration of non-healing wounds includes pressure ulcers, ulcers associated with vascular insufficiency, surgical, and traumatic wounds.

Similarly, nerve and brain tissue could also be regenerated by using polynucleotides or polypeptides, as well as agonists or antagonists of the present invention, to proliferate and differentiate nerve cells. Diseases that could be treated using this method include central and

10 peripheral nervous system diseases, neuropathies, or mechanical and traumatic disorders (e.g., spinal cord disorders, head trauma, cerebrovascular disease, and stroke). Specifically, diseases associated with peripheral nerve injuries, peripheral neuropathy (e.g., resulting from chemotherapy or other medical therapies), localized neuropathies, and central nervous system diseases (e.g.,

15 Alzheimer's disease, Parkinson's disease, Huntington's disease, amyotrophic lateral sclerosis, and Shy-Drager syndrome), could all be treated using the polynucleotides or polypeptides, as well as agonists or antagonists of the present invention.

#### Gastrointestinal Disorders

Polynucleotides or polypeptides, or agonists or antagonists of the present invention,

20 may be used to detect, prevent, diagnose, prognosticate, treat, and/or ameliorate gastrointestinal diseases and disorders, including inflammatory diseases and/or conditions, infections, cancers (e.g., intestinal neoplasms (carcinoid tumor of the small intestine, non-Hodgkin's lymphoma of the small intestine, small bowel lymphoma)), and ulcers, such as peptic ulcers.

Gastrointestinal disorders include dysphagia, odynophagia, inflammation of the

25 esophagus, peptic esophagitis, gastric reflux, submucosal fibrosis and stricturing, Mallory-Weiss lesions, leiomyomas, lipomas, epidermal cancers, adeoncarcinomas, gastric retention disorders, gastroenteritis, gastric atrophy, gastric/stomach cancers, polyps of the stomach, autoimmune disorders such as pernicious anemia, pyloric stenosis, gastritis (bacterial, viral, eosinophilic, stress-induced, chronic erosive, atrophic, plasma cell, and Ménétrier's), and peritoneal diseases (e.g.,

30 chyloperitoneum, hemoperitoneum, mesenteric cyst, mesenteric lymphadenitis, mesenteric vascular occlusion, panniculitis, neoplasms, peritonitis, pneumoperitoneum, bubphrenic abscess,).

Gastrointestinal disorders also include disorders associated with the small intestine, such as malabsorption syndromes, distension, irritable bowel syndrome, sugar intolerance, celiac disease, duodenal ulcers, duodenitis, tropical sprue, Whipple's disease, intestinal

35 lymphangiectasia, Crohn's disease, appendicitis, obstructions of the ileum, Meckel's diverticulum, multiple diverticula, failure of complete rotation of the small and large intestine, lymphoma, and

bacterial and parasitic diseases (such as Traveler's diarrhea, typhoid and paratyphoid, cholera, infection by Roundworms (*Ascariasis lumbricoides*), Hookworms (*Ancylostoma duodenale*), Threadworms (*Enterobius vermicularis*), Tapeworms (*Taenia saginata*, *Echinococcus granulosus*, *Diphyllobothrium spp.*, and *T. solium*).

- 5 Liver diseases and/or disorders include intrahepatic cholestasis (alagille syndrome, biliary liver cirrhosis), fatty liver (alcoholic fatty liver, reye syndrome), hepatic vein thrombosis, hepatolenticular degeneration, hepatomegaly, hepatopulmonary syndrome, hepatorenal syndrome, portal hypertension (esophageal and gastric varices), liver abscess (amebic liver abscess), liver cirrhosis (alcoholic, biliary and experimental), alcoholic liver diseases (fatty liver, hepatitis, cirrhosis), parasitic (hepatic echinococcosis, fascioliasis, amebic liver abscess), jaundice (hemolytic, hepatocellular, and cholestatic), cholestasis, portal hypertension, liver enlargement, ascites, hepatitis (alcoholic hepatitis, animal hepatitis, chronic hepatitis (autoimmune, hepatitis B, hepatitis C, hepatitis D, drug induced), toxic hepatitis, viral human hepatitis (hepatitis A, hepatitis B, hepatitis C, hepatitis D, hepatitis E), Wilson's disease, granulomatous hepatitis, secondary biliary cirrhosis, hepatic encephalopathy, portal hypertension, varices, hepatic encephalopathy, primary biliary cirrhosis, primary sclerosing cholangitis, hepatocellular adenoma, hemangiomas, bile stones, liver failure (hepatic encephalopathy, acute liver failure), and liver neoplasms (angiomyolipoma, calcified liver metastases, cystic liver metastases, epithelial tumors, fibrolamellar hepatocarcinoma, focal nodular hyperplasia, hepatic adenoma, hepatobiliary cystadenoma, hepatoblastoma, hepatocellular carcinoma, hepatoma, liver cancer, liver hemangioendothelioma, mesenchymal hamartoma, mesenchymal tumors of liver, nodular regenerative hyperplasia, benign liver tumors (Hepatic cysts [Simple cysts, Polycystic liver disease, Hepatobiliary cystadenoma, Choledochal cyst], Mesenchymal tumors [Mesenchymal hamartoma, Infantile hemangioendothelioma, Hemangioma, Peliosis hepatis, Lipomas, Inflammatory pseudotumor, Miscellaneous], Epithelial tumors [Bile duct epithelium (Bile duct hamartoma, Bile duct adenoma), Hepatocyte (Adenoma, Focal nodular hyperplasia, Nodular regenerative hyperplasia)], malignant liver tumors [hepatocellular, hepatoblastoma, hepatocellular carcinoma, cholangiocellular, cholangiocarcinoma, cystadenocarcinoma, tumors of blood vessels, angiosarcoma, Kaposi's sarcoma, hemangioendothelioma, other tumors, embryonal sarcoma, fibrosarcoma, leiomyosarcoma, rhabdomyosarcoma, carcinosarcoma, teratoma, carcinoid, squamous carcinoma, primary lymphoma]), peliosis hepatis, erythrohepatic porphyria, hepatic porphyria (acute intermittent porphyria, porphyria cutanea tarda), Zellweger syndrome).
- 10
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- Pancreatic diseases and/or disorders include acute pancreatitis, chronic pancreatitis (acute necrotizing pancreatitis, alcoholic pancreatitis), neoplasms (adenocarcinoma of the pancreas, cystadenocarcinoma, insulinoma, gastrinoma, and glucagonoma, cystic neoplasms, islet-cell tumors, pancreoblastoma), and other pancreatic diseases (e.g., cystic fibrosis, cyst (pancreatic pseudocyst, pancreatic fistula, insufficiency)).
- 35



Gallbladder diseases include gallstones (cholelithiasis and choledocholithiasis), postcholecystectomy syndrome, diverticulosis of the gallbladder, acute cholecystitis, chronic cholecystitis, bile duct tumors, and mucocele.

- Diseases and/or disorders of the large intestine include antibiotic-associated colitis,
- 5 diverticulitis, ulcerative colitis, acquired megacolon, abscesses, fungal and bacterial infections, anorectal disorders (e.g., fissures, hemorrhoids), colonic diseases (colitis, colonic neoplasms [colon cancer, adenomatous colon polyps (e.g., villous adenoma), colon carcinoma, colorectal cancer], colonic diverticulitis, colonic diverticulosis, megacolon [Hirschsprung disease, toxic megacolon]; sigmoid diseases [proctocolitis, sigmoid neoplasms]), constipation, Crohn's disease,
  - 10 diarrhea (infantile diarrhea, dysentery), duodenal diseases (duodenal neoplasms, duodenal obstruction, duodenal ulcer, duodenitis), enteritis (enterocolitis), HIV enteropathy, ileal diseases (ileal neoplasms, ileitis), immunoproliferative small intestinal disease, inflammatory bowel disease (ulcerative colitis, Crohn's disease), intestinal atresia, parasitic diseases (anisakiasis, balantidiasis, blastocystis infections, cryptosporidiosis, dientamoebiasis, amebic dysentery, giardiasis), intestinal
  - 15 fistula (rectal fistula), intestinal neoplasms (cecal neoplasms, colonic neoplasms, duodenal neoplasms, ileal neoplasms, intestinal polyps, jejunal neoplasms, rectal neoplasms), intestinal obstruction (afferent loop syndrome, duodenal obstruction, impacted feces, intestinal pseudo-obstruction [cecal volvulus], intussusception), intestinal perforation, intestinal polyps (colonic polyps, gardner syndrome, peutz-jeghers syndrome), jejunal diseases (jejunal neoplasms),
  - 20 malabsorption syndromes (blind loop syndrome, celiac disease, lactose intolerance, short bowel syndrome, tropical sprue, whipple's disease), mesenteric vascular occlusion, pneumatosis cystoides intestinalis, protein-losing enteropathies (intestinal lymphangiectasis), rectal diseases (anus diseases, fecal incontinence, hemorrhoids, proctitis, rectal fistula, rectal prolapse, rectocele), peptic ulcer (duodenal ulcer, peptic esophagitis, hemorrhage, perforation, stomach ulcer,
  - 25 Zollinger-Ellison syndrome), postgastrectomy syndromes (dumping syndrome), stomach diseases (e.g., achlorhydria, duodenogastric reflux (bile reflux), gastric antral vascular ectasia, gastric fistula, gastric outlet obstruction, gastritis (atrophic or hypertrophic), gastroparesis, stomach dilatation, stomach diverticulum, stomach neoplasms (gastric cancer, gastric polyps, gastric adenocarcinoma, hyperplastic gastric polyp), stomach rupture, stomach ulcer, stomach volvulus),
  - 30 tuberculosis, visceroptosis, vomiting (e.g., hematemesis, hyperemesis gravidarum, postoperative nausea and vomiting) and hemorrhagic colitis.

- Further diseases and/or disorders of the gastrointestinal system include biliary tract diseases, such as, gastroschisis, fistula (e.g., biliary fistula, esophageal fistula, gastric fistula, intestinal fistula, pancreatic fistula), neoplasms (e.g., biliary tract neoplasms, esophageal
- 35 neoplasms, such as adenocarcinoma of the esophagus, esophageal squamous cell carcinoma, gastrointestinal neoplasms, pancreatic neoplasms, such as adenocarcinoma of the pancreas,

- mucinous cystic neoplasm of the pancreas, pancreatic cystic neoplasms, pancreatoblastoma, and peritoneal neoplasms), esophageal disease (e.g., bullous diseases, candidiasis, glycogenic acanthosis, ulceration, barrett esophagus varices, atresia, cyst, diverticulum (e.g., Zenker's diverticulum), fistula (e.g., tracheoesophageal fistula), motility disorders (e.g., CREST syndrome, 5 deglutition disorders, achalasia, spasm, gastroesophageal reflux), neoplasms, perforation (e.g., Boerhaave syndrome, Mallory-Weiss syndrome), stenosis, esophagitis, diaphragmatic hernia (e.g., hiatal hernia); gastrointestinal diseases, such as, gastroenteritis (e.g., cholera morbus, norwalk virus infection), hemorrhage (e.g., hematemesis, melena, peptic ulcer hemorrhage), stomach neoplasms (gastric cancer, gastric polyps, gastric adenocarcinoma, stomach cancer)), hernia (e.g., 10 congenital diaphragmatic hernia, femoral hernia, inguinal hernia, obturator hernia, umbilical hernia, ventral hernia), and intestinal diseases (e.g., cecal diseases (appendicitis, cecal neoplasms)).

#### Chemotaxis

- 15 Polynucleotides or polypeptides, as well as agonists or antagonists of the present invention may have chemotaxis activity. A chemotactic molecule attracts or mobilizes cells (e.g., monocytes, fibroblasts, neutrophils, T-cells, mast cells, eosinophils, epithelial and/or endothelial cells) to a particular site in the body, such as inflammation, infection, or site of hyperproliferation. The mobilized cells can then fight off and/or heal the particular trauma or abnormality.
- 20 Polynucleotides or polypeptides, as well as agonists or antagonists of the present invention may increase chemotactic activity of particular cells. These chemotactic molecules can then be used to treat inflammation, infection, hyperproliferative disorders, or any immune system disorder by increasing the number of cells targeted to a particular location in the body. For example, chemotactic molecules can be used to treat wounds and other trauma to tissues by 25 attracting immune cells to the injured location. Chemotactic molecules of the present invention can also attract fibroblasts, which can be used to treat wounds.

- It is also contemplated that polynucleotides or polypeptides, as well as agonists or antagonists of the present invention may inhibit chemotactic activity. These molecules could also be used to treat disorders. Thus, polynucleotides or polypeptides, as well as agonists or 30 antagonists of the present invention could be used as an inhibitor of chemotaxis.

#### Binding Activity

- A polypeptide of the present invention may be used to screen for molecules that bind to the polypeptide or for molecules to which the polypeptide binds. The binding of the polypeptide and the molecule may activate (agonist), increase, inhibit (antagonist), or decrease 35 activity of the polypeptide or the molecule bound. Examples of such molecules include antibodies, oligonucleotides, proteins (e.g., receptors), or small molecules.

Preferably, the molecule is closely related to the natural ligand of the polypeptide, e.g., a fragment of the ligand, or a natural substrate, a ligand, a structural or functional mimetic. (See, Coligan et al., Current Protocols in Immunology 1(2):Chapter 5 (1991)). Similarly, the molecule can be closely related to the natural receptor to which the polypeptide binds, or at least, a  
5 fragment of the receptor capable of being bound by the polypeptide (e.g., active site). In either case, the molecule can be rationally designed using known techniques.

Preferably, the screening for these molecules involves producing appropriate cells which express the polypeptide. Preferred cells include cells from mammals, yeast, *Drosophila*, or *E. coli*. Cells expressing the polypeptide (or cell membrane containing the expressed polypeptide)  
10 are then preferably contacted with a test compound potentially containing the molecule to observe binding, stimulation, or inhibition of activity of either the polypeptide or the molecule.

The assay may simply test binding of a candidate compound to the polypeptide, wherein binding is detected by a label, or in an assay involving competition with a labeled competitor. Further, the assay may test whether the candidate compound results in a signal  
15 generated by binding to the polypeptide.

Alternatively, the assay can be carried out using cell-free preparations, polypeptide/molecule affixed to a solid support, chemical libraries, or natural product mixtures. The assay may also simply comprise the steps of mixing a candidate compound with a solution containing a polypeptide, measuring polypeptide/molecule activity or binding, and comparing the  
20 polypeptide/molecule activity or binding to a standard.

Preferably, an ELISA assay can measure polypeptide level or activity in a sample (e.g., biological sample) using a monoclonal or polyclonal antibody. The antibody can measure polypeptide level or activity by either binding, directly or indirectly, to the polypeptide or by competing with the polypeptide for a substrate.

25 Additionally, the receptor to which the polypeptide of the present invention binds can be identified by numerous methods known to those of skill in the art, for example, ligand panning and FACS sorting (Coligan, et al., Current Protocols in Immun., 1(2), Chapter 5, (1991)). For example, expression cloning is employed wherein polyadenylated RNA is prepared from a cell responsive to the polypeptides, for example, NIH3T3 cells which are known to contain multiple  
30 receptors for the FGF family proteins, and SC-3 cells, and a cDNA library created from this RNA is divided into pools and used to transfect COS cells or other cells that are not responsive to the polypeptides. Transfected cells which are grown on glass slides are exposed to the polypeptide of the present invention, after they have been labeled. The polypeptides can be labeled by a variety of means including iodination or inclusion of a recognition site for a site-specific protein kinase.

35 Following fixation and incubation, the slides are subjected to auto-radiographic analysis. Positive pools are identified and sub-pools are prepared and re-transfected using an

iterative sub-pooling and re-screening process, eventually yielding a single clones that encodes the putative receptor.

As an alternative approach for receptor identification, the labeled polypeptides can be photoaffinity linked with cell membrane or extract preparations that express the receptor molecule.

5 Cross-linked material is resolved by PAGE analysis and exposed to X-ray film. The labeled complex containing the receptors of the polypeptides can be excised, resolved into peptide fragments, and subjected to protein microsequencing. The amino acid sequence obtained from microsequencing would be used to design a set of degenerate oligonucleotide probes to screen a cDNA library to identify the genes encoding the putative receptors.

10 Moreover, the techniques of gene-shuffling, motif-shuffling, exon-shuffling, and/or codon-shuffling (collectively referred to as "DNA shuffling") may be employed to modulate the activities of the polypeptide of the present invention thereby effectively generating agonists and antagonists of the polypeptide of the present invention. *See generally*, U.S. Patent Nos. 5,605,793, 5,811,238, 5,830,721, 5,834,252, and 5,837,458, and Patten, P. A., *et al.*, *Curr. Opinion Biotechnol.* 8:724-33 (1997); Harayama, S. *Trends Biotechnol.* 16(2):76-82 (1998); Hansson, L. O., *et al.*, *J. Mol. Biol.* 287:265-76 (1999); and Lorenzo, M. M. and Blasco, R. *Biotechniques* 24(2):308-13 (1998); each of these patents and publications are hereby incorporated by reference). In one embodiment, alteration of polynucleotides and corresponding polypeptides may be achieved by DNA shuffling. DNA shuffling involves the assembly of two or more DNA segments  
20 into a desired molecule by homologous, or site-specific, recombination. In another embodiment, polynucleotides and corresponding polypeptides may be altered by being subjected to random mutagenesis by error-prone PCR, random nucleotide insertion or other methods prior to recombination. In another embodiment, one or more components, motifs, sections, parts, domains, fragments, etc., of the polypeptide of the present invention may be recombined with one or more  
25 components, motifs, sections, parts, domains, fragments, etc. of one or more heterologous molecules. In preferred embodiments, the heterologous molecules are family members. In further preferred embodiments, the heterologous molecule is a growth factor such as, for example, platelet-derived growth factor (PDGF), insulin-like growth factor (IGF-I), transforming growth factor (TGF)-alpha, epidermal growth factor (EGF), fibroblast growth factor (FGF), TGF-beta, bone morphogenetic protein (BMP)-2, BMP-4, BMP-5, BMP-6, BMP-7, activins A and B,  
30 decapentaplegic(dpp), 60A, OP-2, dorsalin, growth differentiation factors (GDFs), nodal, MIS, inhibin-alpha, TGF-beta1, TGF-beta2, TGF-beta3, TGF-beta5, and glial-derived neurotrophic factor (GDNF).

Other preferred fragments are biologically active fragments of the polypeptide of the present invention. Biologically active fragments are those exhibiting activity similar, but not necessarily identical, to an activity of the polypeptide of the present invention. The biological

activity of the fragments may include an improved desired activity, or a decreased undesirable activity.

Additionally, this invention provides a method of screening compounds to identify those which modulate the action of the polypeptide of the present invention. An example of such an assay comprises combining a mammalian fibroblast cell, a the polypeptide of the present invention, the compound to be screened and  $^3\text{[H]}$  thymidine under cell culture conditions where the fibroblast cell would normally proliferate. A control assay may be performed in the absence of the compound to be screened and compared to the amount of fibroblast proliferation in the presence of the compound to determine if the compound stimulates proliferation by determining the uptake of  $^3\text{[H]}$  thymidine in each case. The amount of fibroblast cell proliferation is measured by liquid scintillation chromatography which measures the incorporation of  $^3\text{[H]}$  thymidine. Both agonist and antagonist compounds may be identified by this procedure.

In another method, a mammalian cell or membrane preparation expressing a receptor for a polypeptide of the present invention is incubated with a labeled polypeptide of the present invention in the presence of the compound. The ability of the compound to enhance or block this interaction could then be measured. Alternatively, the response of a known second messenger system following interaction of a compound to be screened and the receptor is measured and the ability of the compound to bind to the receptor and elicit a second messenger response is measured to determine if the compound is a potential agonist or antagonist. Such second messenger systems include but are not limited to, cAMP guanylate cyclase, ion channels or phosphoinositide hydrolysis.

All of these above assays can be used as diagnostic or prognostic markers. The molecules discovered using these assays can be used to treat disease or to bring about a particular result in a patient (e.g., blood vessel growth) by activating or inhibiting the polypeptide/molecule. Moreover, the assays can discover agents which may inhibit or enhance the production of the polypeptides of the invention from suitably manipulated cells or tissues.

Therefore, the invention includes a method of identifying compounds which bind to a polypeptide of the invention comprising the steps of: (a) incubating a candidate binding compound with a polypeptide of the present invention; and (b) determining if binding has occurred. Moreover, the invention includes a method of identifying agonists/antagonists comprising the steps of: (a) incubating a candidate compound with a polypeptide of the present invention, (b) assaying a biological activity, and (b) determining if a biological activity of the polypeptide has been altered.

**Targeted Delivery**

In another embodiment, the invention provides a method of delivering compositions to targeted cells expressing a receptor for a polypeptide of the invention, or cells expressing a cell bound form of a polypeptide of the invention.

5 As discussed herein, polypeptides or antibodies of the invention may be associated with heterologous polypeptides, heterologous nucleic acids, toxins, or prodrugs via hydrophobic, hydrophilic, ionic and/or covalent interactions. In one embodiment, the invention provides a method for the specific delivery of compositions of the invention to cells by administering polypeptides of the invention (including antibodies) that are associated with heterologous  
10 polypeptides or nucleic acids. In one example, the invention provides a method for delivering a therapeutic protein into the targeted cell. In another example, the invention provides a method for delivering a single stranded nucleic acid (e.g., antisense or ribozymes) or double stranded nucleic acid (e.g., DNA that can integrate into the cell's genome or replicate episomally and that can be transcribed) into the targeted cell.

15 In another embodiment, the invention provides a method for the specific destruction of cells (e.g., the destruction of tumor cells) by administering polypeptides of the invention (e.g., polypeptides of the invention or antibodies of the invention) in association with toxins or cytotoxic prodrugs.

By "toxin" is meant compounds that bind and activate endogenous cytotoxic effector  
20 systems, radioisotopes, holotoxins, modified toxins, catalytic subunits of toxins, or any molecules or enzymes not normally present in or on the surface of a cell that under defined conditions cause the cell's death. Toxins that may be used according to the methods of the invention include, but are not limited to, radioisotopes known in the art, compounds such as, for example, antibodies (or complement fixing containing portions thereof) that bind an inherent or induced endogenous  
25 cytotoxic effector system, thymidine kinase, endonuclease, RNase, alpha toxin, ricin, abrin, *Pseudomonas* exotoxin A, diphtheria toxin, saporin, momordin, gelonin, pokeweed antiviral protein, alpha-sarcin and cholera toxin. By "cytotoxic prodrug" is meant a non-toxic compound that is converted by an enzyme, normally present in the cell, into a cytotoxic compound. Cytotoxic prodrugs that may be used according to the methods of the invention include, but are not  
30 limited to, glutamyl derivatives of benzoic acid mustard alkylating agent, phosphate derivatives of etoposide or mitomycin C, cytosine arabinoside, daunorubisin, and phenoxyacetamide derivatives of doxorubicin.

**Drug Screening**

35 Further contemplated is the use of the polypeptides of the present invention, or the polynucleotides encoding these polypeptides, to screen for molecules which modify the activities

of the polypeptides of the present invention. Such a method would include contacting the polypeptide of the present invention with a selected compound(s) suspected of having antagonist or agonist activity, and assaying the activity of these polypeptides following binding.

This invention is particularly useful for screening therapeutic compounds by using the polypeptides of the present invention, or binding fragments thereof, in any of a variety of drug screening techniques. The polypeptide or fragment employed in such a test may be affixed to a solid support, expressed on a cell surface, free in solution, or located intracellularly. One method of drug screening utilizes eukaryotic or prokaryotic host cells which are stably transformed with recombinant nucleic acids expressing the polypeptide or fragment. Drugs are screened against such transformed cells in competitive binding assays. One may measure, for example, the formulation of complexes between the agent being tested and a polypeptide of the present invention.

Thus, the present invention provides methods of screening for drugs or any other agents which affect activities mediated by the polypeptides of the present invention. These methods comprise contacting such an agent with a polypeptide of the present invention or a fragment thereof and assaying for the presence of a complex between the agent and the polypeptide or a fragment thereof, by methods well known in the art. In such a competitive binding assay, the agents to screen are typically labeled. Following incubation, free agent is separated from that present in bound form, and the amount of free or uncomplexed label is a measure of the ability of a particular agent to bind to the polypeptides of the present invention.

Another technique for drug screening provides high throughput screening for compounds having suitable binding affinity to the polypeptides of the present invention, and is described in great detail in European Patent Application 84/03564, published on September 13, 1984, which is incorporated herein by reference herein. Briefly stated, large numbers of different small peptide test compounds are synthesized on a solid substrate, such as plastic pins or some other surface. The peptide test compounds are reacted with polypeptides of the present invention and washed. Bound polypeptides are then detected by methods well known in the art. Purified polypeptides are coated directly onto plates for use in the aforementioned drug screening techniques. In addition, non-neutralizing antibodies may be used to capture the peptide and immobilize it on the solid support.

This invention also contemplates the use of competitive drug screening assays in which neutralizing antibodies capable of binding polypeptides of the present invention specifically compete with a test compound for binding to the polypeptides or fragments thereof. In this manner, the antibodies are used to detect the presence of any peptide which shares one or more antigenic epitopes with a polypeptide of the invention.

**Antisense And Ribozyme (Antagonists)**

In specific embodiments, antagonists according to the present invention are nucleic acids corresponding to the sequences contained in SEQ ID NO:X, or the complementary strand thereof, and/or to cDNA sequences contained in cDNA ATCC Deposit No:Z identified for example, in Table 1A and/or 1B. In one embodiment, antisense sequence is generated internally, by the organism, in another embodiment, the antisense sequence is separately administered (see, for example, O'Connor, J., *Neurochem.* 56:560 (1991). *Oligodeoxynucleotides as Antisense Inhibitors of Gene Expression*, CRC Press, Boca Raton, FL (1988). Antisense technology can be used to control gene expression through antisense DNA or RNA, or through triple-helix formation. Antisense techniques are discussed for example, in Okano, J., *Neurochem.* 56:560 (1991); *Oligodeoxynucleotides as Antisense Inhibitors of Gene Expression*, CRC Press, Boca Raton, FL (1988). Triple helix formation is discussed in, for instance, Lee et al., *Nucleic Acids Research* 6:3073 (1979); Cooney et al., *Science* 241:456 (1988); and Dervan et al., *Science* 251:1300 (1991). The methods are based on binding of a polynucleotide to a complementary DNA or RNA.

For example, the use of c-myc and c-myb antisense RNA constructs to inhibit the growth of the non-lymphocytic leukemia cell line HL-60 and other cell lines was previously described. (Wickstrom et al. (1988); Anfossi et al. (1989)). These experiments were performed *in vitro* by incubating cells with the oligoribonucleotide. A similar procedure for *in vivo* use is described in WO 91/15580. Briefly, a pair of oligonucleotides for a given antisense RNA is produced as follows: A sequence complimentary to the first 15 bases of the open reading frame is flanked by an EcoRI site on the 5' end and a HindIII site on the 3' end. Next, the pair of oligonucleotides is heated at 90°C for one minute and then annealed in 2X ligation buffer (20mM TRIS HCl pH 7.5, 10mM MgCl<sub>2</sub>, 10mM dithiothreitol (DTT) and 0.2 mM ATP) and then ligated to the EcoRI/Hind III site of the retroviral vector PMV7 (WO 91/15580).

For example, the 5' coding portion of a polynucleotide that encodes the polypeptide of the present invention may be used to design an antisense RNA oligonucleotide of from about 10 to 40 base pairs in length. A DNA oligonucleotide is designed to be complementary to a region of the gene involved in transcription thereby preventing transcription and the production of the receptor. The antisense RNA oligonucleotide hybridizes to the mRNA *in vivo* and blocks translation of the mRNA molecule into receptor polypeptide.

In one embodiment, the antisense nucleic acid of the invention is produced intracellularly by transcription from an exogenous sequence. For example, a vector or a portion thereof, is transcribed, producing an antisense nucleic acid (RNA) of the invention. Such a vector would contain a sequence encoding the antisense nucleic acid. Such a vector can remain episomal or become chromosomally integrated, as long as it can be transcribed to produce the desired antisense RNA. Such vectors can be constructed by recombinant DNA technology methods



standard in the art. Vectors can be plasmid, viral, or others known in the art, used for replication and expression in vertebrate cells. Expression of the sequence encoding the polypeptide of the present invention or fragments thereof, can be by any promoter known in the art to act in vertebrate, preferably human cells. Such promoters can be inducible or constitutive. Such promoters include, but are not limited to, the SV40 early promoter region (Bernoist and Chambon, Nature 29:304-310 (1981), the promoter contained in the 3' long terminal repeat of Rous sarcoma virus (Yamamoto et al., Cell 22:787-797 (1980), the herpes thymidine promoter (Wagner et al., Proc. Natl. Acad. Sci. U.S.A. 78:1441-1445 (1981), the regulatory sequences of the metallothionein gene (Brinster, et al., Nature 296:39-42 (1982)), etc.

10 The antisense nucleic acids of the invention comprise a sequence complementary to at least a portion of an RNA transcript of a gene of the present invention. However, absolute complementarity, although preferred, is not required. A sequence "complementary to at least a portion of an RNA," referred to herein, means a sequence having sufficient complementarity to be  
15 to hybridize with the RNA, forming a stable duplex; in the case of double stranded antisense nucleic acids, a single strand of the duplex DNA may thus be tested, or triplex formation may be assayed. The ability to hybridize will depend on both the degree of complementarity and the length of the antisense nucleic acid. Generally, the larger the hybridizing nucleic acid, the more base mismatches with a RNA it may contain and still form a stable duplex (or triplex as the case may be). One skilled in the art can ascertain a tolerable degree of mismatch by use of standard  
20 procedures to determine the melting point of the hybridized complex.

Oligonucleotides that are complementary to the 5' end of the message, e.g., the 5' untranslated sequence up to and including the AUG initiation codon, should work most efficiently at inhibiting translation. However, sequences complementary to the 3' untranslated sequences of mRNAs have been shown to be effective at inhibiting translation of mRNAs as well. See  
25 generally, Wagner, R., 1994, Nature 372:333-335. Thus, oligonucleotides complementary to either the 5'- or 3'- non- translated, non-coding regions of polynucleotide sequences described herein could be used in an antisense approach to inhibit translation of endogenous mRNA. Oligonucleotides complementary to the 5' untranslated region of the mRNA should include the complement of the AUG start codon. Antisense oligonucleotides complementary to mRNA  
30 coding regions are less efficient inhibitors of translation but could be used in accordance with the invention. Whether designed to hybridize to the 5'-, 3'- or coding region of mRNA of the present invention, antisense nucleic acids should be at least six nucleotides in length, and are preferably oligonucleotides ranging from 6 to about 50 nucleotides in length. In specific aspects the oligonucleotide is at least 10 nucleotides, at least 17 nucleotides, at least 25 nucleotides or at least  
35 50 nucleotides.

The polynucleotides of the invention can be DNA or RNA or chimeric mixtures or

derivatives or modified versions thereof, single-stranded or double-stranded. The oligonucleotide can be modified at the base moiety, sugar moiety, or phosphate backbone, for example, to improve stability of the molecule, hybridization, etc. The oligonucleotide may include other appended groups such as peptides (e.g., for targeting host cell receptors *in vivo*), or agents facilitating transport across the cell membrane (see, e.g., Letsinger et al., 1989, Proc. Natl. Acad. Sci. U.S.A. 86:6553-6556; Lemaitre et al., 1987, Proc. Natl. Acad. Sci. 84:648-652; PCT Publication No. WO88/09810, published December 15, 1988) or the blood-brain barrier (see, e.g., PCT Publication No. WO89/10134, published April 25, 1988), hybridization-triggered cleavage agents. (See, e.g., Krol et al., 1988, BioTechniques 6:958-976) or intercalating agents. (See, e.g., Zon, 1988, Pharm. Res. 5:539-549). To this end, the oligonucleotide may be conjugated to another molecule, e.g., a peptide, hybridization triggered cross-linking agent, transport agent, hybridization-triggered cleavage agent, etc.

The antisense oligonucleotide may comprise at least one modified base moiety which is selected from the group including, but not limited to, 5-fluorouracil, 5-bromouracil, 5-chlorouracil, 5-iodouracil, hypoxanthine, xantine, 4-acetylcytosine, 5-(carboxyhydroxymethyl)uracil, 5-carboxymethylaminomethyl-2-thiouridine, 5-carboxymethylaminomethyluracil, dihydrouracil, beta-D-galactosylqueosine, inosine, N6-isopentenyladenine, 1-methylguanine, 1-methylinosine, 2,2-dimethylguanine, 2-methyladenine, 2-methylguanine, 3-methylcytosine, 5-methylcytosine, N6-adenine, 7-methylguanine, 5-methylaminomethyluracil, 5-methoxyaminomethyl-2-thiouracil, beta-D-mannosylqueosine, 5'-methoxycarboxymethyluracil, 5-methoxyuracil, 2-methylthio-N6-isopentenyladenine, uracil-5-oxyacetic acid (v), wybutoxosine, pseudouracil, queosine, 2-thiocytosine, 5-methyl-2-thiouracil, 2-thiouracil, 4-thiouracil, 5-methyluracil, uracil-5-oxyacetic acid methylester, uracil-5-oxyacetic acid (v), 5-methyl-2-thiouracil, 3-(3-amino-3-N-2-carboxypropyl) uracil, (acp3)w, and 2,6-diaminopurine.

The antisense oligonucleotide may also comprise at least one modified sugar moiety selected from the group including, but not limited to, arabinose, 2-fluoroarabinose, xylulose, and hexose.

In yet another embodiment, the antisense oligonucleotide comprises at least one modified phosphate backbone selected from the group including, but not limited to, a phosphorothioate, a phosphorodithioate, a phosphoramidothioate, a phosphoramidate, a phosphordiamidate, a methylphosphonate, an alkyl phosphotriester, and a formacetal or analog thereof.

In yet another embodiment, the antisense oligonucleotide is an a-anomeric oligonucleotide. An a-anomeric oligonucleotide forms specific double-stranded hybrids with complementary RNA in which, contrary to the usual b-units, the strands run parallel to each other (Gautier et al., 1987, Nucl. Acids Res. 15:6625-6641). The oligonucleotide is a 2'-0-

methylribonucleotide (Inoue et al., 1987, Nucl. Acids Res. 15:6131-6148), or a chimeric RNA-DNA analogue (Inoue et al., 1987, FEBS Lett. 215:327-330).

Polynucleotides of the invention may be synthesized by standard methods known in the art, e.g. by use of an automated DNA synthesizer (such as are commercially available from  
5 Biosearch, Applied Biosystems, etc.). As examples, phosphorothioate oligonucleotides may be synthesized by the method of Stein et al. (1988, Nucl. Acids Res. 16:3209), methylphosphonate oligonucleotides can be prepared by use of controlled pore glass polymer supports (Sarin et al., 1988, Proc. Natl. Acad. Sci. U.S.A. 85:7448-7451), etc.

While antisense nucleotides complementary to the coding region sequence could be  
10 used, those complementary to the transcribed untranslated region are most preferred.

Potential antagonists according to the invention also include catalytic RNA, or a ribozyme (See, e.g., PCT International Publication WO 90/11364, published October 4, 1990; Sarver et al, Science 247:1222-1225 (1990). While ribozymes that cleave mRNA at site specific recognition sequences can be used to destroy mRNAs, the use of hammerhead ribozymes is  
15 preferred. Hammerhead ribozymes cleave mRNAs at locations dictated by flanking regions that form complementary base pairs with the target mRNA. The sole requirement is that the target mRNA have the following sequence of two bases: 5'-UG-3'. The construction and production of hammerhead ribozymes is well known in the art and is described more fully in Haseloff and Gerlach, Nature 334:585-591 (1988). There are numerous potential hammerhead ribozyme  
20 cleavage sites within the nucleotide sequence of SEQ ID NO:X. Preferably, the ribozyme is engineered so that the cleavage recognition site is located near the 5' end of the mRNA; i.e., to increase efficiency and minimize the intracellular accumulation of non-functional mRNA transcripts.

As in the antisense approach, the ribozymes of the invention can be composed of  
25 modified oligonucleotides (e.g., for improved stability, targeting, etc.) and should be delivered to cells which express *in vivo*. DNA constructs encoding the ribozyme may be introduced into the cell in the same manner as described above for the introduction of antisense encoding DNA. A preferred method of delivery involves using a DNA construct "encoding" the ribozyme under the control of a strong constitutive promoter, such as, for example, pol III or pol II promoter, so that  
30 transfected cells will produce sufficient quantities of the ribozyme to destroy endogenous messages and inhibit translation. Since ribozymes unlike antisense molecules, are catalytic, a lower intracellular concentration is required for efficiency.

Antagonist/agonist compounds may be employed to inhibit the cell growth and proliferation effects of the polypeptides of the present invention on neoplastic cells and tissues, i.e.  
35 stimulation of angiogenesis of tumors, and, therefore, retard or prevent abnormal cellular growth and proliferation, for example, in tumor formation or growth.

The antagonist/agonist may also be employed to prevent hyper-vascular diseases, and prevent the proliferation of epithelial lens cells after extracapsular cataract surgery. Prevention of the mitogenic activity of the polypeptides of the present invention may also be desirous in cases such as restenosis after balloon angioplasty.

5 The antagonist/agonist may also be employed to prevent the growth of scar tissue during wound healing.

The antagonist/agonist may also be employed to treat the diseases described herein.

Thus, the invention provides a method of treating disorders or diseases, including but not limited to the disorders or diseases listed throughout this application, associated with  
10 overexpression of a polynucleotide of the present invention by administering to a patient (a) an antisense molecule directed to the polynucleotide of the present invention, and/or (b) a ribozyme directed to the polynucleotide of the present invention.

#### **Binding Peptides and Other Molecules**

15 The invention also encompasses screening methods for identifying polypeptides and nonpolypeptides that bind polypeptides of the invention, and the binding molecules identified thereby. These binding molecules are useful, for example, as agonists and antagonists of the polypeptides of the invention. Such agonists and antagonists can be used, in accordance with the invention, in the therapeutic embodiments described in detail, below.

20 This method comprises the steps of:

- a. contacting polypeptides of the invention with a plurality of molecules; and
- b. identifying a molecule that binds the polypeptides of the invention.

The step of contacting the polypeptides of the invention with the plurality of molecules may be effected in a number of ways. For example, one may contemplate immobilizing  
25 the polypeptides on a solid support and bringing a solution of the plurality of molecules in contact with the immobilized polypeptides. Such a procedure would be akin to an affinity chromatographic process, with the affinity matrix being comprised of the immobilized polypeptides of the invention. The molecules having a selective affinity for the polypeptides can then be purified by affinity selection. The nature of the solid support, process for attachment of the  
30 polypeptides to the solid support, solvent, and conditions of the affinity isolation or selection are largely conventional and well known to those of ordinary skill in the art.

Alternatively, one may also separate a plurality of polypeptides into substantially separate fractions comprising a subset of or individual polypeptides. For instance, one can separate the plurality of polypeptides by gel electrophoresis, column chromatography, or like method  
35 known to those of ordinary skill for the separation of polypeptides. The individual polypeptides can also be produced by a transformed host cell in such a way as to be expressed on or about its

outer surface (e.g., a recombinant phage). Individual isolates can then be "probed" by the polypeptides of the invention, optionally in the presence of an inducer should one be required for expression, to determine if any selective affinity interaction takes place between the polypeptides and the individual clone. Prior to contacting the polypeptides with each fraction comprising individual polypeptides, the polypeptides could first be transferred to a solid support for additional convenience. Such a solid support may simply be a piece of filter membrane, such as one made of nitrocellulose or nylon. In this manner, positive clones could be identified from a collection of transformed host cells of an expression library, which harbor a DNA construct encoding a polypeptide having a selective affinity for polypeptides of the invention. Furthermore, the amino acid sequence of the polypeptide having a selective affinity for the polypeptides of the invention can be determined directly by conventional means or the coding sequence of the DNA encoding the polypeptide can frequently be determined more conveniently. The primary sequence can then be deduced from the corresponding DNA sequence. If the amino acid sequence is to be determined from the polypeptide itself, one may use microsequencing techniques. The sequencing technique may include mass spectroscopy.

In certain situations, it may be desirable to wash away any unbound polypeptides from a mixture of the polypeptides of the invention and the plurality of polypeptides prior to attempting to determine or to detect the presence of a selective affinity interaction. Such a wash step may be particularly desirable when the polypeptides of the invention or the plurality of polypeptides are bound to a solid support.

The plurality of molecules provided according to this method may be provided by way of diversity libraries, such as random or combinatorial peptide or nonpeptide libraries which can be screened for molecules that specifically bind polypeptides of the invention. Many libraries are known in the art that can be used, e.g., chemically synthesized libraries, recombinant (e.g., phage display libraries), and in vitro translation-based libraries. Examples of chemically synthesized libraries are described in Fodor et al., 1991, *Science* 251:767-773; Houghten et al., 1991, *Nature* 354:84-86; Lam et al., 1991, *Nature* 354:82-84; Medynski, 1994, *Bio/Technology* 12:709-710; Gallop et al., 1994, *J. Medicinal Chemistry* 37(9):1233-1251; Ohlmeyer et al., 1993, *Proc. Natl. Acad. Sci. USA* 90:10922-10926; Erb et al., 1994, *Proc. Natl. Acad. Sci. USA* 91:11422-11426; Houghten et al., 1992, *Biotechniques* 13:412; Jayawickreme et al., 1994, *Proc. Natl. Acad. Sci. USA* 91:1614-1618; Salmon et al., 1993, *Proc. Natl. Acad. Sci. USA* 90:11708-11712; PCT Publication No. WO 93/20242; and Brenner and Lerner, 1992, *Proc. Natl. Acad. Sci. USA* 89:5381-5383.

Examples of phage display libraries are described in Scott and Smith, 1990, *Science* 249:386-390; Devlin et al., 1990, *Science*, 249:404-406; Christian, R. B., et al., 1992, *J. Mol. Biol.* 227:711-718; Lenstra, 1992, *J. Immunol. Meth.* 152:149-157; Kay et al., 1993, *Gene* 128:59-65;

and PCT Publication No. WO 94/18318 dated Aug. 18, 1994.

In vitro translation-based libraries include but are not limited to those described in PCT Publication No. WO 91/05058 dated Apr. 18, 1991; and Mattheakis et al., 1994, Proc. Natl. Acad. Sci. USA 91:9022-9026.

5 By way of examples of nonpeptide libraries, a benzodiazepine library (see e.g., Bunin et al., 1994, Proc. Natl. Acad. Sci. USA 91:4708-4712) can be adapted for use. Peptoid libraries (Simon et al., 1992, Proc. Natl. Acad. Sci. USA 89:9367-9371) can also be used. Another example of a library that can be used, in which the amide functionalities in peptides have been permethylated to generate a chemically transformed combinatorial library, is described by Ostresh  
10 et al. (1994, Proc. Natl. Acad. Sci. USA 91:11138-11142).

The variety of non-peptide libraries that are useful in the present invention is great. For example, Ecker and Crooke, 1995, Bio/Technology 13:351-360 list benzodiazepines, hydantoins, piperazinediones, biphenyls, sugar analogs, beta-mercaptoketones, arylacetic acids, acylpiperidines, benzopyrans, cubanes, xanthines, aminimides, and oxazolones as among the  
15 chemical species that form the basis of various libraries.

Non-peptide libraries can be classified broadly into two types: decorated monomers and oligomers. Decorated monomer libraries employ a relatively simple scaffold structure upon which a variety functional groups is added. Often the scaffold will be a molecule with a known useful pharmacological activity. For example, the scaffold might be the benzodiazepine structure.

20 Non-peptide oligomer libraries utilize a large number of monomers that are assembled together in ways that create new shapes that depend on the order of the monomers. Among the monomer units that have been used are carbamates, pyrrolinones, and morpholinos. Peptoids, peptide-like oligomers in which the side chain is attached to the alpha amino group rather than the alpha carbon, form the basis of another version of non-peptide oligomer libraries. The first non-peptide oligomer libraries utilized a single type of monomer and thus contained a repeating  
25 backbone. Recent libraries have utilized more than one monomer, giving the libraries added flexibility.

Screening the libraries can be accomplished by any of a variety of commonly known methods. See, e.g., the following references, which disclose screening of peptide libraries: Pamley  
30 and Smith, 1989, Adv. Exp. Med. Biol. 251:215-218; Scott and Smith, 1990, Science 249:386-390; Fowlkes et al., 1992, BioTechniques 13:422-427; Oldenburg et al., 1992, Proc. Natl. Acad. Sci. USA 89:5393-5397; Yu et al., 1994, Cell 76:933-945; Staudt et al., 1988, Science 241:577-580; Bock et al., 1992, Nature 355:564-566; Tuerk et al., 1992, Proc. Natl. Acad. Sci. USA 89:6988-6992; Ellington et al., 1992, Nature 355:850-852; U.S. Pat. No. 5,096,815, U.S. Pat. No.  
35 5,223,409, and U.S. Pat. No. 5,198,346, all to Ladner et al.; Rebar and Pabo, 1993, Science 263:671-673; and CT Publication No. WO 94/18318.

In a specific embodiment, screening to identify a molecule that binds polypeptides of the invention can be carried out by contacting the library members with polypeptides of the invention immobilized on a solid phase and harvesting those library members that bind to the polypeptides of the invention. Examples of such screening methods, termed "panning" techniques  
5 are described by way of example in Parmley and Smith, 1988, Gene 73:305-318; Fowlkes et al., 1992, BioTechniques 13:422-427; PCT Publication No. WO 94/18318; and in references cited herein.

In another embodiment, the two-hybrid system for selecting interacting proteins in yeast (Fields and Song, 1989, Nature 340:245-246; Chien et al., 1991, Proc. Natl. Acad. Sci. USA  
10 88:9578-9582) can be used to identify molecules that specifically bind to polypeptides of the invention.

Where the binding molecule is a polypeptide, the polypeptide can be conveniently selected from any peptide library, including random peptide libraries, combinatorial peptide libraries, or biased peptide libraries. The term "biased" is used herein to mean that the method of  
15 generating the library is manipulated so as to restrict one or more parameters that govern the diversity of the resulting collection of molecules, in this case peptides.

Thus, a truly random peptide library would generate a collection of peptides in which the probability of finding a particular amino acid at a given position of the peptide is the same for all 20 amino acids. A bias can be introduced into the library, however, by specifying, for example,  
20 that a lysine occur every fifth amino acid or that positions 4, 8, and 9 of a decapeptide library be fixed to include only arginine. Clearly, many types of biases can be contemplated, and the present invention is not restricted to any particular bias. Furthermore, the present invention contemplates specific types of peptide libraries, such as phage displayed peptide libraries and those that utilize a DNA construct comprising a lambda phage vector with a DNA insert.

As mentioned above, in the case of a binding molecule that is a polypeptide, the polypeptide may have about 6 to less than about 60 amino acid residues, preferably about 6 to about 10 amino acid residues, and most preferably, about 6 to about 22 amino acids. In another  
25 embodiment, a binding polypeptide has in the range of 15-100 amino acids, or 20-50 amino acids.

The selected binding polypeptide can be obtained by chemical synthesis or  
30 recombinant expression.

#### Other Activities

A polypeptide, polynucleotide, agonist, or antagonist of the present invention, as a result of the ability to stimulate vascular endothelial cell growth, may be employed in treatment for  
35 stimulating re-vascularization of ischemic tissues due to various disease conditions such as thrombosis, arteriosclerosis, and other cardiovascular conditions. The polypeptide,

polynucleotide, agonist, or antagonist of the present invention may also be employed to stimulate angiogenesis and limb regeneration, as discussed above.

5 A polypeptide, polynucleotide, agonist, or antagonist of the present invention may also be employed for treating wounds due to injuries, burns, post-operative tissue repair, and ulcers since they are mitogenic to various cells of different origins, such as fibroblast cells and skeletal muscle cells, and therefore, facilitate the repair or replacement of damaged or diseased tissue.

10 A polypeptide, polynucleotide, agonist, or antagonist of the present invention may also be employed stimulate neuronal growth and to treat and prevent neuronal damage which occurs in certain neuronal disorders or neuro-degenerative conditions such as Alzheimer's disease, Parkinson's disease, and AIDS-related complex. A polypeptide, polynucleotide, agonist, or antagonist of the present invention may have the ability to stimulate chondrocyte growth, therefore, they may be employed to enhance bone and periodontal regeneration and aid in tissue transplants or bone grafts.

15 A polypeptide, polynucleotide, agonist, or antagonist of the present invention may be also be employed to prevent skin aging due to sunburn by stimulating keratinocyte growth.

20 A polypeptide, polynucleotide, agonist, or antagonist of the present invention may also be employed for preventing hair loss, since FGF family members activate hair-forming cells and promotes melanocyte growth. Along the same lines, a polypeptide, polynucleotide, agonist, or antagonist of the present invention may be employed to stimulate growth and differentiation of hematopoietic cells and bone marrow cells when used in combination with other cytokines.

25 A polypeptide, polynucleotide, agonist, or antagonist of the present invention may also be employed to maintain organs before transplantation or for supporting cell culture of primary tissues. A polypeptide, polynucleotide, agonist, or antagonist of the present invention may also be employed for inducing tissue of mesodermal origin to differentiate in early embryos.

A polypeptide, polynucleotide, agonist, or antagonist of the present invention may also increase or decrease the differentiation or proliferation of embryonic stem cells, besides, as discussed above, hematopoietic lineage.

30 A polypeptide, polynucleotide, agonist, or antagonist of the present invention may also be used to modulate mammalian characteristics, such as body height, weight, hair color, eye color, skin, percentage of adipose tissue, pigmentation, size, and shape (e.g., cosmetic surgery). Similarly, a polypeptide, polynucleotide, agonist, or antagonist of the present invention may be used to modulate mammalian metabolism affecting catabolism, anabolism, processing, utilization, and storage of energy.

35 A polypeptide, polynucleotide, agonist, or antagonist of the present invention may be used to change a mammal's mental state or physical state by influencing biorhythms, circadian



rhythms, depression (including depressive disorders), tendency for violence, tolerance for pain, reproductive capabilities (preferably by Activin or Inhibin-like activity), hormonal or endocrine levels, appetite, libido, memory, stress, or other cognitive qualities.

5 A polypeptide, polynucleotide, agonist, or antagonist of the present invention may also be used as a food additive or preservative, such as to increase or decrease storage capabilities, fat content, lipid, protein, carbohydrate, vitamins, minerals, cofactors or other nutritional components.

10 The above-recited applications have uses in a wide variety of hosts. Such hosts include, but are not limited to, human, murine, rabbit, goat, guinea pig, camel, horse, mouse, rat, hamster, pig, micro-pig, chicken, goat, cow, sheep, dog, cat, non-human primate, and human. In specific embodiments, the host is a mouse, rabbit, goat, guinea pig, chicken, rat, hamster, pig, sheep, dog or cat. In preferred embodiments, the host is a mammal. In most preferred embodiments, the host is a human.

#### 15 Other Preferred Embodiments

Other preferred embodiments of the claimed invention include an isolated nucleic acid molecule comprising a nucleotide sequence which is at least 95% identical to a sequence of at least about 50 contiguous nucleotides in the nucleotide sequence of SEQ ID NO:X or the complementary strand thereto, the nucleotide sequence as defined in Table 1B or columns 8 and 9 of Table 2 or the complementary strand thereto, and/or cDNA contained in ATCC Deposit No:Z.

20 Also preferred is a nucleic acid molecule wherein said sequence of contiguous nucleotides is included in the nucleotide sequence of the portion of SEQ ID NO:X as defined in column 5, "ORF (From-To)", in Table 1B.

25 Also preferred is a nucleic acid molecule wherein said sequence of contiguous nucleotides is included in the nucleotide sequence of the portion of SEQ ID NO:X as defined in columns 8 and 9, "NT From" and "NT To" respectively, in Table 2.

30 Also preferred is an isolated nucleic acid molecule comprising a nucleotide sequence which is at least 95% identical to a sequence of at least about 150 contiguous nucleotides in the nucleotide sequence of SEQ ID NO:X or the complementary strand thereto, the nucleotide sequence as defined in Table 1B or columns 8 and 9 of Table 2 or the complementary strand thereto, and/or cDNA contained in ATCC Deposit No:Z.

35 Further preferred is an isolated nucleic acid molecule comprising a nucleotide sequence which is at least 95% identical to a sequence of at least about 500 contiguous nucleotides in the nucleotide sequence of SEQ ID NO:X or the complementary strand thereto, the nucleotide sequence as defined in Table 1B or columns 8 and 9 of Table 2 or the complementary strand thereto, and/or cDNA contained in ATCC Deposit No:Z.

A further preferred embodiment is a nucleic acid molecule comprising a nucleotide sequence which is at least 95% identical to the nucleotide sequence of the portion of SEQ ID NO:X defined in column 5, "ORF (From-To)", in Table 1B.

5 A further preferred embodiment is a nucleic acid molecule comprising a nucleotide sequence which is at least 95% identical to the nucleotide sequence of the portion of SEQ ID NO:X defined in columns 8 and 9, "NT From" and "NT To", respectively, in Table 2.

A further preferred embodiment is an isolated nucleic acid molecule comprising a nucleotide sequence which is at least 95% identical to the complete nucleotide sequence of SEQ ID NO:X or the complementary strand thereto, the nucleotide sequence as defined in Table 1B or  
10 columns 8 and 9 of Table 2 or the complementary strand thereto, and/or cDNA contained in ATCC Deposit No:Z.

Also preferred is an isolated nucleic acid molecule which hybridizes under stringent hybridization conditions to a nucleic acid molecule comprising a nucleotide sequence of SEQ ID NO:X or the complementary strand thereto, the nucleotide sequence as defined in Table 1B or  
15 columns 8 and 9 of Table 2 or the complementary strand thereto, and/or cDNA contained in ATCC Deposit No:Z, wherein said nucleic acid molecule which hybridizes does not hybridize under stringent hybridization conditions to a nucleic acid molecule having a nucleotide sequence consisting of only A residues or of only T residues.

Also preferred is a composition of matter comprising a DNA molecule which  
20 comprises the cDNA contained in ATCC Deposit No:Z.

Also preferred is an isolated nucleic acid molecule comprising a nucleotide sequence which is at least 95% identical to a sequence of at least 50 contiguous nucleotides of the cDNA sequence contained in ATCC Deposit No:Z.

Also preferred is an isolated nucleic acid molecule, wherein said sequence of at least  
25 50 contiguous nucleotides is included in the nucleotide sequence of an open reading frame sequence encoded by cDNA contained in ATCC Deposit No:Z.

Also preferred is an isolated nucleic acid molecule comprising a nucleotide sequence which is at least 95% identical to sequence of at least 150 contiguous nucleotides in the nucleotide sequence encoded by cDNA contained in ATCC Deposit No:Z.

30 A further preferred embodiment is an isolated nucleic acid molecule comprising a nucleotide sequence which is at least 95% identical to sequence of at least 500 contiguous nucleotides in the nucleotide sequence encoded by cDNA contained in ATCC Deposit No:Z.

A further preferred embodiment is an isolated nucleic acid molecule comprising a nucleotide sequence which is at least 95% identical to the complete nucleotide sequence encoded  
35 by cDNA contained in ATCC Deposit No:Z.

A further preferred embodiment is a method for detecting in a biological sample a nucleic acid molecule comprising a nucleotide sequence which is at least 95% identical to a sequence of at least 50 contiguous nucleotides in a sequence selected from the group consisting of: a nucleotide sequence of SEQ ID NO:X or the complementary strand thereto; the nucleotide  
5 sequence as defined in Table 1B or columns 8 and 9 of Table 2 or the complementary strand thereto; and a nucleotide sequence encoded by cDNA contained in ATCC Deposit No:Z; which method comprises a step of comparing a nucleotide sequence of at least one nucleic acid molecule in said sample with a sequence selected from said group and determining whether the sequence of said nucleic acid molecule in said sample is at least 95% identical to said selected sequence.

10 Also preferred is the above method wherein said step of comparing sequences comprises determining the extent of nucleic acid hybridization between nucleic acid molecules in said sample and a nucleic acid molecule comprising said sequence selected from said group. Similarly, also preferred is the above method wherein said step of comparing sequences is performed by comparing the nucleotide sequence determined from a nucleic acid molecule in said  
15 sample with said sequence selected from said group. The nucleic acid molecules can comprise DNA molecules or RNA molecules.

A further preferred embodiment is a method for identifying the species, tissue or cell type of a biological sample which method comprises a step of detecting nucleic acid molecules in said sample, if any, comprising a nucleotide sequence that is at least 95% identical to a sequence  
20 of at least 50 contiguous nucleotides in a sequence selected from the group consisting of: a nucleotide sequence of SEQ ID NO:X or the complementary strand thereto; the nucleotide sequence as defined in Table 1B or columns 8 and 9 of Table 2 or the complementary strand thereto; and a nucleotide sequence of the cDNA contained in ATCC Deposit No:Z.

The method for identifying the species, tissue or cell type of a biological sample can  
25 comprise a step of detecting nucleic acid molecules comprising a nucleotide sequence in a panel of at least two nucleotide sequences, wherein at least one sequence in said panel is at least 95% identical to a sequence of at least 50 contiguous nucleotides in a sequence selected from said group.

Also preferred is a method for diagnosing in a subject a pathological condition  
30 associated with abnormal structure or expression of a nucleotide sequence of SEQ ID NO:X or the complementary strand thereto; the nucleotide sequence as defined in Table 1B or columns 8 and 9 of Table 2 or the complementary strand thereto; or the cDNA contained in ATCC Deposit No:Z which encodes a protein, wherein the method comprises a step of detecting in a biological sample obtained from said subject nucleic acid molecules, if any, comprising a nucleotide sequence that is  
35 at least 95% identical to a sequence of at least 50 contiguous nucleotides in a sequence selected from the group consisting of: a nucleotide sequence of SEQ ID NO:X or the complementary strand

thereto; the nucleotide sequence as defined in Table 1B or columns 8 and 9 of Table 2 or the complementary strand thereto; and a nucleotide sequence of cDNA contained in ATCC Deposit No:Z.

5 The method for diagnosing a pathological condition can comprise a step of detecting nucleic acid molecules comprising a nucleotide sequence in a panel of at least two nucleotide sequences, wherein at least one sequence in said panel is at least 95% identical to a sequence of at least 50 contiguous nucleotides in a sequence selected from said group.

10 Also preferred is a composition of matter comprising isolated nucleic acid molecules wherein the nucleotide sequences of said nucleic acid molecules comprise a panel of at least two nucleotide sequences, wherein at least one sequence in said panel is at least 95% identical to a sequence of at least 50 contiguous nucleotides in a sequence selected from the group consisting of: a nucleotide sequence of SEQ ID NO:X or the complementary strand thereto; the nucleotide sequence as defined in Table 1B or columns 8 and 9 of Table 2 or the complementary strand thereto; and a nucleotide sequence encoded by cDNA contained in ATCC Deposit No:Z. The  
15 nucleic acid molecules can comprise DNA molecules or RNA molecules.

Also preferred is a composition of matter comprising isolated nucleic acid molecules wherein the nucleotide sequences of said nucleic acid molecules comprise a DNA microarray or "chip" of at least 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 25, 30, 40, 50, 100, 150, 200, 250, 300, 500, 1000, 2000, 3000, or 4000 nucleotide sequences, wherein at least one sequence in said DNA  
20 microarray or "chip" is at least 95% identical to a sequence of at least 50 contiguous nucleotides in a sequence selected from the group consisting of: a nucleotide sequence of SEQ ID NO:X wherein X is any integer as defined in Table 1A and/or 1B; and a nucleotide sequence encoded by a human cDNA clone identified by a cDNA "Clone ID" in Table 1A and/or 1B.

Also preferred is an isolated polypeptide comprising an amino acid sequence at least  
25 90% identical to a sequence of at least about 10 contiguous amino acids in the polypeptide sequence of SEQ ID NO:Y; a polypeptide encoded by SEQ ID NO:X or the complementary strand thereto; the polypeptide encoded by the nucleotide sequence as defined in columns 8 and 9 of Table 2; and/or a polypeptide encoded by cDNA contained in ATCC Deposit No:Z.

Also preferred is an isolated polypeptide comprising an amino acid sequence at least  
30 95% identical to a sequence of at least about 30 contiguous amino acids in the amino acid sequence of SEQ ID NO:Y; a polypeptide encoded by SEQ ID NO:X or the complementary strand thereto; the polypeptide encoded by the nucleotide sequence as defined in columns 8 and 9 of Table 2; and/or a polypeptide encoded by cDNA contained in ATCC Deposit No:Z.

Further preferred is an isolated polypeptide comprising an amino acid sequence at  
35 least 95% identical to a sequence of at least about 100 contiguous amino acids in the amino acid sequence of SEQ ID NO:Y; a polypeptide encoded by SEQ ID NO:X or the complementary strand

thereto; the polypeptide encoded by the nucleotide sequence as defined in columns 8 and 9 of Table 2; and/or a polypeptide encoded by cDNA contained in ATCC Deposit No:Z.

Further preferred is an isolated polypeptide comprising an amino acid sequence at least 95% identical to the complete amino acid sequence of SEQ ID NO:Y; a polypeptide encoded by SEQ ID NO:X or the complementary strand thereto; the polypeptide encoded by the nucleotide sequence as defined in columns 8 and 9 of Table 2; and/or a polypeptide encoded by cDNA contained in ATCC Deposit No:Z.

Further preferred is an isolated polypeptide comprising an amino acid sequence at least 90% identical to a sequence of at least about 10 contiguous amino acids in the complete amino acid sequence of a polypeptide encoded by contained in ATCC Deposit No:Z.

Also preferred is a polypeptide wherein said sequence of contiguous amino acids is included in the amino acid sequence of a portion of said polypeptide encoded by cDNA contained in ATCC Deposit No:Z; a polypeptide encoded by SEQ ID NO:X or the complementary strand thereto; the polypeptide encoded by the nucleotide sequence as defined in columns 8 and 9 of Table 2; and/or the polypeptide sequence of SEQ ID NO:Y.

Also preferred is an isolated polypeptide comprising an amino acid sequence at least 95% identical to a sequence of at least about 30 contiguous amino acids in the amino acid sequence of a polypeptide encoded by the cDNA contained in ATCC Deposit No:Z.

Also preferred is an isolated polypeptide comprising an amino acid sequence at least 95% identical to a sequence of at least about 100 contiguous amino acids in the amino acid sequence of a polypeptide encoded by cDNA contained in ATCC Deposit No:Z.

Also preferred is an isolated polypeptide comprising an amino acid sequence at least 95% identical to the amino acid sequence of a polypeptide encoded by the cDNA contained in ATCC Deposit No:Z.

Further preferred is an isolated antibody which binds specifically to a polypeptide comprising an amino acid sequence that is at least 90% identical to a sequence of at least 10 contiguous amino acids in a sequence selected from the group consisting of: a polypeptide sequence of SEQ ID NO:Y; a polypeptide encoded by SEQ ID NO:X or the complementary strand thereto; the polypeptide encoded by the nucleotide sequence as defined in columns 8 and 9 of Table 2; and a polypeptide encoded by the cDNA contained in ATCC Deposit No:Z.

Further preferred is a method for detecting in a biological sample a polypeptide comprising an amino acid sequence which is at least 90% identical to a sequence of at least 10 contiguous amino acids in a sequence selected from the group consisting of: a polypeptide sequence of SEQ ID NO:Y; a polypeptide encoded by SEQ ID NO:X or the complementary strand thereto; the polypeptide encoded by the nucleotide sequence as defined in columns 8 and 9 of Table 2; and a polypeptide encoded by the cDNA contained in ATCC Deposit No:Z; which

method comprises a step of comparing an amino acid sequence of at least one polypeptide molecule in said sample with a sequence selected from said group and determining whether the sequence of said polypeptide molecule in said sample is at least 90% identical to said sequence of at least 10 contiguous amino acids.

5           Also preferred is the above method wherein said step of comparing an amino acid sequence of at least one polypeptide molecule in said sample with a sequence selected from said group comprises determining the extent of specific binding of polypeptides in said sample to an antibody which binds specifically to a polypeptide comprising an amino acid sequence that is at least 90% identical to a sequence of at least 10 contiguous amino acids in a sequence selected from  
10   the group consisting of: a polypeptide sequence of SEQ ID NO:Y; a polypeptide encoded by SEQ ID NO:X or the complementary strand thereto; the polypeptide encoded by the nucleotide sequence as defined in columns 8 and 9 of Table 2; and a polypeptide encoded by the cDNA contained in ATCC Deposit No:Z.

          Also preferred is the above method wherein said step of comparing sequences is  
15   performed by comparing the amino acid sequence determined from a polypeptide molecule in said sample with said sequence selected from said group.

          Also preferred is a method for identifying the species, tissue or cell type of a biological sample which method comprises a step of detecting polypeptide molecules in said sample, if any, comprising an amino acid sequence that is at least 90% identical to a sequence of at least 10 contiguous amino acids in a sequence selected from the group consisting of: polypeptide  
20   sequence of SEQ ID NO:Y; a polypeptide encoded by SEQ ID NO:X or the complementary strand thereto; the polypeptide encoded by the nucleotide sequence as defined in columns 8 and 9 of Table 2; and a polypeptide encoded by the cDNA contained in ATCC Deposit No:Z.

          Also preferred is the above method for identifying the species, tissue or cell type of a  
25   biological sample, which method comprises a step of detecting polypeptide molecules comprising an amino acid sequence in a panel of at least two amino acid sequences, wherein at least one sequence in said panel is at least 90% identical to a sequence of at least 10 contiguous amino acids in a sequence selected from the above group.

          Also preferred is a method for diagnosing in a subject a pathological condition  
30   associated with abnormal structure or expression of a nucleic acid sequence identified in Table 1A, 1B or Table 2 encoding a polypeptide, which method comprises a step of detecting in a biological sample obtained from said subject polypeptide molecules comprising an amino acid sequence in a panel of at least two amino acid sequences, wherein at least one sequence in said panel is at least 90% identical to a sequence of at least 10 contiguous amino acids in a sequence selected from the  
35   group consisting of: polypeptide sequence of SEQ ID NO:Y; a polypeptide encoded by SEQ ID NO:X or the complementary strand thereto; the polypeptide encoded by the nucleotide sequence as

defined in columns 8 and 9 of Table 2; and a polypeptide encoded by the cDNA contained in ATCC Deposit No:Z.

In any of these methods, the step of detecting said polypeptide molecules includes using an antibody.

5           Also preferred is an isolated nucleic acid molecule comprising a nucleotide sequence which is at least 95% identical to a nucleotide sequence encoding a polypeptide wherein said polypeptide comprises an amino acid sequence that is at least 90% identical to a sequence of at least 10 contiguous amino acids in a sequence selected from the group consisting of: polypeptide sequence of SEQ ID NO:Y; a polypeptide encoded by SEQ ID NO:X or the complementary strand  
10 thereto; the polypeptide encoded by the nucleotide sequence as defined in columns 8 and 9 of Table 2; and a polypeptide encoded by the cDNA contained in ATCC Deposit No:Z.

Also preferred is an isolated nucleic acid molecule, wherein said nucleotide sequence encoding a polypeptide has been optimized for expression of said polypeptide in a prokaryotic host.

15           Also preferred is a polypeptide molecule, wherein said polypeptide comprises an amino acid sequence selected from the group consisting of: polypeptide sequence of SEQ ID NO:Y; a polypeptide encoded by SEQ ID NO:X or the complementary strand thereto; the polypeptide encoded by the nucleotide sequence as defined in columns 8 and 9 of Table 2; and a polypeptide encoded by the cDNA contained in ATCC Deposit No:Z.

20           Further preferred is a method of making a recombinant vector comprising inserting any of the above isolated nucleic acid molecule into a vector. Also preferred is the recombinant vector produced by this method. Also preferred is a method of making a recombinant host cell comprising introducing the vector into a host cell, as well as the recombinant host cell produced by this method.

25           Also preferred is a method of making an isolated polypeptide comprising culturing this recombinant host cell under conditions such that said polypeptide is expressed and recovering said polypeptide. Also preferred is this method of making an isolated polypeptide, wherein said recombinant host cell is a eukaryotic cell and said polypeptide is a human protein comprising an amino acid sequence selected from the group consisting of: polypeptide sequence of SEQ ID  
30 NO:Y; a polypeptide encoded by SEQ ID NO:X or the complementary strand thereto; the polypeptide encoded by the nucleotide sequence as defined in columns 8 and 9 of Table 2; and a polypeptide encoded by the cDNA contained in ATCC Deposit No:Z. The isolated polypeptide produced by this method is also preferred.

35           Also preferred is a method of treatment of an individual in need of an increased level of a protein activity, which method comprises administering to such an individual a Therapeutic comprising an amount of an isolated polypeptide, polynucleotide, immunogenic fragment or

analogue thereof, binding agent, antibody, or antigen binding fragment of the claimed invention effective to increase the level of said protein activity in said individual.

Also preferred is a method of treatment of an individual in need of a decreased level of a protein activity, which method comprised administering to such an individual a Therapeutic comprising an amount of an isolated polypeptide, polynucleotide, immunogenic fragment or analogue thereof, binding agent, antibody, or antigen binding fragment of the claimed invention effective to decrease the level of said protein activity in said individual.

Also preferred is a method of treatment of an individual in need of a specific delivery of toxic compositions to diseased cells (e.g., tumors, leukemias or lymphomas), which method comprises administering to such an individual a Therapeutic comprising an amount of an isolated polypeptide of the invention, including, but not limited to a binding agent, or antibody of the claimed invention that are associated with toxin or cytotoxic prodrugs.

Having generally described the invention, the same will be more readily understood by reference to the following examples, which are provided by way of illustration and are not intended as limiting.

#### Description of Table 6

Table 6 summarizes some of the ATCC Deposits, Deposit dates, and ATCC designation numbers of deposits made with the ATCC in connection with the present application. These deposits were made in addition to those described in the Table 1A.

**Table 6**

ATCC Deposits	Deposit Date	ATCC Designation Number
LP01, LP02, LP03, LP04, LP05, LP06, LP07, LP08, LP09, LP10, LP11,	May-20-97	209059, 209060, 209061, 209062, 209063, 209064, 209065, 209066, 209067, 209068, 209069
LP12	Jan-12-98	209579
LP13	Jan-12-98	209578
LP14	Jul-16-98	203067
LP15	Jul-16-98	203068
LP16	Feb-1-99	203609
LP17	Feb-1-99	203610
LP20	Nov-17-98	203485
LP21	Jun-18-99	PTA-252
LP22	Jun-18-99	PTA-253
LP23	Dec-22-99	PTA-1081



### Examples

#### Example 1: Isolation of a Selected cDNA Clone From the Deposited Sample

5 Each ATCC Deposit No:Z is contained in a plasmid vector. Table 7 identifies the vectors used to construct the cDNA library from which each clone was isolated. In many cases, the vector used to construct the library is a phage vector from which a plasmid has been excised. The following correlates the related plasmid for each phage vector used in constructing the cDNA library. For example, where a particular clone is identified in Table 7 as being isolated in the  
10 vector "Lambda Zap," the corresponding deposited clone is in "pBluescript."

#### Vector Used to Construct Library Corresponding Deposited Plasmid

Lambda Zap	pBluescript (pBS)
Uni-Zap XR	pBluescript (pBS)
Zap Express	pBK
15 lafmid BA	plafmid BA
pSport1	pSport1
pCMVSPORT 2.0	pCMVSPORT 2.0
pCMVSPORT 3.0	pCMVSPORT 3.0
pCR <sup>®</sup> 2.1	pCR <sup>®</sup> 2.1

20 Vectors Lambda Zap (U.S. Patent Nos. 5,128,256 and 5,286,636), Uni-Zap XR (U.S. Patent Nos. 5,128, 256 and 5,286,636), Zap Express (U.S. Patent Nos. 5,128,256 and 5,286,636), pBluescript (pBS) (Short, J. M. et al., Nucleic Acids Res. 16:7583-7600 (1988); Alting-Mees, M. A. and Short, J. M., Nucleic Acids Res. 17:9494 (1989)) and pBK (Alting-Mees, M. A. et al., Strategies 5:58-61 (1992)) are commercially available from Stratagene Cloning Systems, Inc.,  
25 11011 N. Torrey Pines Road, La Jolla, CA, 92037. pBS contains an ampicillin resistance gene and pBK contains a neomycin resistance gene. Both can be transformed into E. coli strain XL-1 Blue, also available from Stratagene. pBS comes in 4 forms SK+, SK-, KS+ and KS. The S and K refers to the orientation of the polylinker to the T7 and T3 primer sequences which flank the polylinker region ("S" is for SacI and "K" is for KpnI which are the first sites on each respective  
30 end of the linker). "+" or "-" refer to the orientation of the f1 origin of replication ("ori"), such that in one orientation, single stranded rescue initiated from the f1 ori generates sense strand DNA and in the other, antisense.

Vectors pSport1, pCMVSPORT 2.0 and pCMVSPORT 3.0, were obtained from Life Technologies, Inc., P. O. Box 6009, Gaithersburg, MD 20897. All Sport vectors contain an  
35 ampicillin resistance gene and may be transformed into E. coli strain DH10B, also available from Life Technologies. (See, for instance, Gruber, C. E., et al., Focus 15:59 (1993)). Vector lafmid

- BA (Bento Soares, Columbia University, NY) contains an ampicillin resistance gene and can be transformed into E. coli strain XL-1 Blue. Vector pCR<sup>®</sup>2.1, which is available from Invitrogen, 1600 Faraday Avenue, Carlsbad, CA 92008, contains an ampicillin resistance gene and may be transformed into E. coli strain DH10B, available from Life Technologies. (See, for instance,
- 5 Clark, J. M., Nuc. Acids Res. 16:9677-9686 (1988) and Mead, D. et al., Bio/Technology 9: (1991)). Preferably, a polynucleotide of the present invention does not comprise the phage vector sequences identified for the particular clone in Table 7, as well as the corresponding plasmid vector sequences designated above.

- The deposited material in the sample assigned the ATCC Deposit Number cited by
- 10 reference to Table 1A, Table 2, Table 6 and Table 7 for any given cDNA clone also may contain one or more additional plasmids, each comprising a cDNA clone different from that given clone. Thus, deposits sharing the same ATCC Deposit Number contain at least a plasmid for each ATCC Deposit No:Z.

**TABLE 7**

15

Libraries owned by Catalog	Catalog Description	Vector	ATCC Deposit
HUKA HUKB HUKC HUKD HUKF HUKG	Human Uterine Cancer	Lambda ZAP II	LP01
HCNA HCNB	Human Colon	Lambda Zap II	LP01
HFFA	Human Fetal Brain, random primed	Lambda Zap II	LP01
HTWA	Resting T-Cell	Lambda ZAP II	LP01
HBQA	Early Stage Human Brain, random primed	Lambda ZAP II	LP01
HLMB HLMF HLMG HLMH HLMJ HLMK HLMM HLMN	breast lymph node CDNA library	Lambda ZAP II	LP01
HCQA HCQB	human colon cancer	Lambda ZAP II	LP01
HMEA HMEC HMED HMEF HMEG HMEI HMEJ HMEK HMEI	Human Microvascular Endothelial Cells, fract. A	Lambda ZAP II	LP01
HUSA HUSC	Human Umbilical Vein Endothelial Cells, fract. A	Lambda ZAP II	LP01
HLQA HLQB	Hepatocellular Tumor	Lambda ZAP II	LP01
HHGA HHGB HHGC HHGD	Hemangiopericytoma	Lambda ZAP II	LP01
HSDM	Human Striatum Depression, re-rescue	Lambda ZAP II	LP01
HUSH	H Umbilical Vein Endothelial Cells, frac A, re-excision	Lambda ZAP II	LP01
HSGS	Salivary gland, subtracted	Lambda ZAP II	LP01
HFXA HFXB HFXC HFXD HFXE HFXF HFXG HFXH	Brain frontal cortex	Lambda ZAP II	LP01
HPQA HPQB HPQC	PERM TF274	Lambda ZAP II	LP01
HFXJ HFXK	Brain Frontal Cortex, re-excision	Lambda ZAP II	LP01
HCWA HCWB HCWC HCWD HCWE HCWF HCWG HCWH	CD34 positive cells (Cord Blood)	ZAP Express	LP02

Libraries owned by Catalog	Catalog Description	Vector	ATCC Deposit
HCWI HCWJ HCWK			
HCUA HCUB HCUC	CD34 depleted Buffy Coat (Cord Blood)	ZAP Express	LP02
HRSM	A-14 cell line	ZAP Express	LP02
HRSA	A1-CELL LINE	ZAP Express	LP02
HCUD HCUE HCUF HCUG HCUH HCUI	CD34 depleted Buffy Coat (Cord Blood), re-excision	ZAP Express	LP02
HBXE HBXF HBXG	H. Whole Brain #2, re-excision	ZAP Express	LP02
HRLM	L8 cell line	ZAP Express	LP02
HBXA HBXB HBXC HBXD	Human Whole Brain #2 - Oligo dT > 1.5Kb	ZAP Express	LP02
HUDA HUDB HUDC	Testes	ZAP Express	LP02
HHTM HHTN HHTO	H. hypothalamus, frac A, re-excision	ZAP Express	LP02
HHTL	H. hypothalamus, frac A	ZAP Express	LP02
HASA HASD	Human Adult Spleen	Uni-ZAP XR	LP03
HFKE HFKE HFKE HFKE HFKE HFKE	Human Fetal Kidney	Uni-ZAP XR	LP03
HE8A HE8B HE8C HE8D HE8E HE8F HE8M HE8N	Human 8 Week Whole Embryo	Uni-ZAP XR	LP03
HGBA HGBD HGBE HGBF HGBG HGBH HGBI	Human Gall Bladder	Uni-ZAP XR	LP03
HLHA HLHB HLHC HLHD HLHE HLHF HLHG HLHH HLHQ	Human Fetal Lung III	Uni-ZAP XR	LP03
HPMA HPMB HPMC HPMD HPME HPMF HPMG HPMH	Human Placenta	Uni-ZAP XR	LP03
HPRA HPRB HPRC HPRD	Human Prostate	Uni-ZAP XR	LP03
HSIA HSIC HSID HSIE	Human Adult Small Intestine	Uni-ZAP XR	LP03
HTEA HTEB HTEC HTED HTEE HTEF HTEG HTEH HTEI HTEJ HTEK	Human Testes	Uni-ZAP XR	LP03
HTPA HTPB HTPC HTPD HTPF	Human Pancreas Tumor	Uni-ZAP XR	LP03
HTTA HTTB HTTC HTTD HTTE HTTF	Human Testes Tumor	Uni-ZAP XR	LP03
HAPA HAPB HAPC HAPM	Human Adult Pulmonary	Uni-ZAP XR	LP03
HETA HETB HETC HETD HETE HETF HETG HETH HETI	Human Endometrial Tumor	Uni-ZAP XR	LP03
HHFB HHFC HHFD HHFE HHFF HHFG HHFH HHFI	Human Fetal Heart	Uni-ZAP XR	LP03
HHPB HHPD HHPD HHPD HHPD HHPD HHPD HHPD HHPD HHPD	Human Hippocampus	Uni-ZAP XR	LP03
HCE1 HCE2 HCE3 HCE4 HCE5 HCEB HCEC HCEH HCEE HCEF HCEG	Human Cerebellum	Uni-ZAP XR	LP03
HUVB HUVB HUVB HUVB HUVB HUVB HUVB HUVB HUVB HUVB	Human Umbilical Vein, Endo. remake	Uni-ZAP XR	LP03
HSTA HSTB HSTC HSTD	Human Skin Tumor	Uni-ZAP XR	LP03

Libraries owned by Catalog	Catalog Description	Vector	ATCC Deposit
HTAA HTAB HTAC HTAD HTAE	Human Activated T-Cells	Uni-ZAP XR	LP03
HFEA HFEB HFEC	Human Fetal Epithelium (Skin)	Uni-ZAP XR	LP03
HJPA HJPB HJPC HJPD	HUMAN JURKAT MEMBRANE BOUND POLYSOMES	Uni-ZAP XR	LP03
HESA	Human epithelioid sarcoma	Uni-Zap XR	LP03
HLTA HLTB HLTC HLTD HLTE HLTf	Human T-Cell Lymphoma	Uni-ZAP XR	LP03
HFTA HFTB HFTC HFTD	Human Fetal Dura Mater	Uni-ZAP XR	LP03
HRDA HRDB HRDC HRDD HRDE HRDF	Human Rhabdomyosarcoma	Uni-ZAP XR	LP03
HCAA HCAB HCAC	Cem cells cyclohexamide treated	Uni-ZAP XR	LP03
HRGA HRGB HRGC HRGD	Raji Cells, cyclohexamide treated	Uni-ZAP XR	LP03
HSUA HSUB HSUC HSUM	Supt Cells, cyclohexamide treated	Uni-ZAP XR	LP03
HT4A HT4C HT4D	Activated T-Cells, 12 hrs.	Uni-ZAP XR	LP03
HE9A HE9B HE9C HE9D HE9E HE9F HE9G HE9H HE9M HE9N	Nine Week Old Early Stage Human	Uni-ZAP XR	LP03
HATA HATB HATC HATD HATE	Human Adrenal Gland Tumor	Uni-ZAP XR	LP03
HT5A	Activated T-Cells, 24 hrs.	Uni-ZAP XR	LP03
HFGA HFGM	Human Fetal Brain	Uni-ZAP XR	LP03
HNEA HNEB HNEC HNED HNEE	Human Neutrophil	Uni-ZAP XR	LP03
HBGB HBGD	Human Primary Breast Cancer	Uni-ZAP XR	LP03
HBNA HBNB	Human Normal Breast	Uni-ZAP XR	LP03
HCAS	Cem Cells, cyclohexamide treated, subtra	Uni-ZAP XR	LP03
HHPS	Human Hippocampus, subtracted	pBS	LP03
HKCS HKCU	Human Colon Cancer, subtracted	pBS	LP03
HRGS	Raji cells, cyclohexamide treated, subtracted	pBS	LP03
HSUT	Supt cells, cyclohexamide treated, differentially expressed	pBS	LP03
HT4S	Activated T-Cells, 12 hrs, subtracted	Uni-ZAP XR	LP03
HCDA HCDB HCDC HCDD HCDE	Human Chondrosarcoma	Uni-ZAP XR	LP03
HOAA HOAB HOAC	Human Osteosarcoma	Uni-ZAP XR	LP03
HTLA HTLB HTLC HTLD HTLE HTLf	Human adult testis, large inserts	Uni-ZAP XR	LP03
HLMA HLMC HLMD	Breast Lymph node cDNA library	Uni-ZAP XR	LP03
H6EA H6EB H6EC	HL-60, PMA 4H	Uni-ZAP XR	LP03
HTXA HTXB HTXC HTXD	Activated T-Cell	Uni-ZAP XR	LP03

Libraries owned by Catalog	Catalog Description	Vector	ATCC Deposit
HTXE HTXF HTXG HTXH	(12hs)/Thiouridine labelledEco		
HNFA HNFB HNFC HNFD HNFE HNFF HNFG HNFH HNFJ	Human Neutrophil, Activated	Uni-ZAP XR	LP03
HTOB HTOC	HUMAN TONSILS, FRACTION 2	Uni-ZAP XR	LP03
HMGB	Human OB MG63 control fraction I	Uni-ZAP XR	LP03
HOPB	Human OB HOS control fraction I	Uni-ZAP XR	LP03
HORB	Human OB HOS treated (10 nM E2) fraction I	Uni-ZAP XR	LP03
HSVA HSVB HSVC	Human Chronic Synovitis	Uni-ZAP XR	LP03
HROA	HUMAN STOMACH	Uni-ZAP XR	LP03
HBJA HBJB HBJC HBJD HBJE HBJF HBJG HBJH HBJI HBJJ HBJK	HUMAN B CELL LYMPHOMA	Uni-ZAP XR	LP03
HCRA HCRB HCRC	human corpus colosum	Uni-ZAP XR	LP03
HODA HODB HODC HODD	human ovarian cancer	Uni-ZAP XR	LP03
HDSA	Dermatofibrosarcoma Protuberance	Uni-ZAP XR	LP03
HMWA HMWB HMWC HMWD HMWE HMWF HMWG HMWH HMWI HMWJ	Bone Marrow Cell Line (RS4;11)	Uni-ZAP XR	LP03
HSOA	stomach cancer (human)	Uni-ZAP XR	LP03
HERA	SKIN	Uni-ZAP XR	LP03
HMDA	Brain-medulloblastoma	Uni-ZAP XR	LP03
HGLA HGLB HGLD	Glioblastoma	Uni-ZAP XR	LP03
HEAA	H. Atrophic Endometrium	Uni-ZAP XR	LP03
HBCA HBCB	H. Lymph node breast Cancer	Uni-ZAP XR	LP03
HPWT	Human Prostate BPH, re- excision	Uni-ZAP XR	LP03
HFVG HFVH HFVI	Fetal Liver, subtraction II	pBS	LP03
HNFI	Human Neutrophils, Activated, re-excision	pBS	LP03
HBMB HBMC HBMD	Human Bone Marrow, re- excision	pBS	LP03
HKML HKMM HKMN	H. Kidney Medulla, re-excision	pBS	LP03
HKIX HKIY	H. Kidney Cortex, subtracted	pBS	LP03
HADT	H. Amygdala Depression, subtracted	pBS	LP03
H6AS	HL-60, untreated, subtracted	Uni-ZAP XR	LP03
H6ES	HL-60, PMA 4H, subtracted	Uni-ZAP XR	LP03
H6BS	HL-60, RA 4h, Subtracted	Uni-ZAP XR	LP03
H6CS	HL-60, PMA 1d, subtracted	Uni-ZAP XR	LP03
HTXJ HTXK	Activated T- cell(12h)/Thiouridine-re- excision	Uni-ZAP XR	LP03
HMSA HMSB HMSC HMSD HMSE HMSF HMSG HMSH	Monocyte activated	Uni-ZAP XR	LP03

Libraries owned by Catalog	Catalog Description	Vector	ATCC Deposit
HMSI HMSJ HMSK			
HAGA HAGB HAGC HAGD HAGE HAGF	Human Amygdala	Uni-ZAP XR	LP03
HSRA HSRB HSRE	STROMAL - OSTEOCLASTOMA	Uni-ZAP XR	LP03
HSRD HSRF HSRG HSRH	Human Osteoclastoma Stromal Cells - unamplified	Uni-ZAP XR	LP03
HSQA HSQB HSQC HSQD HSQE HSQF HSQG	Stromal cell TF274	Uni-ZAP XR	LP03
HSKA HSKB HSKC HSKD HSKE HSKF HSKZ	Smooth muscle, serum treated	Uni-ZAP XR	LP03
HSLA HSLB HSLC HSLD HSLF HSLG	Smooth muscle, control	Uni-ZAP XR	LP03
HSDA HSDD HSDE HSDF HSDG HSDH	Spinal cord	Uni-ZAP XR	LP03
HPWS	Prostate-BPH subtracted II	pBS	LP03
HSKW HSKX HSKY	Smooth Muscle- HASTE normalized	pBS	LP03
HFPB HFPC HFPD	H. Frontal cortex, epileptic; re- excision	Uni-ZAP XR	LP03
HSDI HSDJ HSDK	Spinal Cord, re-excision	Uni-ZAP XR	LP03
HSKN HSKO	Smooth Muscle Serum Treated, Norm	pBS	LP03
HSKG HSKH HSKI	Smooth muscle, serum induced, re-exc	pBS	LP03
HFCA HFCE HFCD HFCE HFCE	Human Fetal Brain	Uni-ZAP XR	LP04
HPTA HPTB HPTD	Human Pituitary	Uni-ZAP XR	LP04
HTHB HTHC HTHD	Human Thymus	Uni-ZAP XR	LP04
HE6B HE6C HE6D HE6E HE6F HE6G HE6S	Human Whole Six Week Old Embryo	Uni-ZAP XR	LP04
HSSA HSSB HSSC HSSD HSSE HSSF HSSG HSSH HSSI HSSJ HSSK	Human Synovial Sarcoma	Uni-ZAP XR	LP04
HE7T	7 Week Old Early Stage Human, subtracted	Uni-ZAP XR	LP04
HEPA HEPB HEPC	Human Epididymus	Uni-ZAP XR	LP04
HSNA HSNB HSNC HSNM HSNN	Human Synovium	Uni-ZAP XR	LP04
HPFB HPFC HPFD HPFE	Human Prostate Cancer, Stage C fraction	Uni-ZAP XR	LP04
HE2A HE2D HE2E HE2H HE2I HE2M HE2N HE2O	12 Week Old Early Stage Human	Uni-ZAP XR	LP04
HE2B HE2C HE2F HE2G HE2P HE2Q	12 Week Old Early Stage Human, II	Uni-ZAP XR	LP04
HPTS HPTT HPTU	Human Pituitary, subtracted	Uni-ZAP XR	LP04
HAUA HAUB HAUC	Amniotic Cells - TNF induced	Uni-ZAP XR	LP04
HAQA HAQB HAQC HAQD	Amniotic Cells - Primary Culture	Uni-ZAP XR	LP04
HWTA HWTB HWTC	wilm's tumor	Uni-ZAP XR	LP04

Libraries owned by Catalog	Catalog Description	Vector	ATCC Deposit
HBSD	Bone Cancer, re-excision	Uni-ZAP XR	LP04
HSGB	Salivary gland, re-excision	Uni-ZAP XR	LP04
HSJA HSJB HSJC	Smooth muscle-ILb induced	Uni-ZAP XR	LP04
HSXA HSXB HSXC HSXD	Human Substantia Nigra	Uni-ZAP XR	LP04
HSXA HSXB HSXC HSXD	Smooth muscle, IL1b induced	Uni-ZAP XR	LP04
HOUA HOUB HOUC HOUD HOUE	Adipocytes	Uni-ZAP XR	LP04
HPWA HPWB HPWC HPWD HPWE	Prostate BPH	Uni-ZAP XR	LP04
HELA HELB HELC HELD HELE HELF HELG HELH	Endothelial cells-control	Uni-ZAP XR	LP04
HEMA HEMB HEMC HEMD HEME HEMF HEMG HEMH	Endothelial-induced	Uni-ZAP XR	LP04
HBIA HBIB HBIC	Human Brain, Striatum	Uni-ZAP XR	LP04
HHSA HHSB HHSC HHSD HHSE	Human Hypothalamus, Schizophrenia	Uni-ZAP XR	LP04
HNGA HNGB HNGC HNGD HNGE HNGF HNGG HNGH HNGI HNGJ	neutrophils control	Uni-ZAP XR	LP04
HNHA HNHB HNHC HNHD HNHE HNHF HNHG HNHH HNHI HNHI	Neutrophils IL-1 and LPS induced	Uni-ZAP XR	LP04
HSDB HSDC	STRIATUM DEPRESSION	Uni-ZAP XR	LP04
HHPT	Hypothalamus	Uni-ZAP XR	LP04
HSAT HSAU HSAV HSAW HSAX HSAY HSAZ	Anergic T-cell	Uni-ZAP XR	LP04
HBMS HBMT HBMU HBMV HBMW HBMX	Bone marrow	Uni-ZAP XR	LP04
HOEA HOEB HOEC HOED HOEE HOEF HOEJ	Osteoblasts	Uni-ZAP XR	LP04
HAIA HAIB HAIC HAID HAIE HAIF	Epithelial-TNF $\alpha$ and INF induced	Uni-ZAP XR	LP04
HTGA HTGB HTGC HTGD	Apoptotic T-cell	Uni-ZAP XR	LP04
HMCA HMCB HMCC HMCD HMCE	Macrophage-oxLDL	Uni-ZAP XR	LP04
HMAA HMAB HMAB HMAD HMAE HMAF HMAG	Macrophage (GM-CSF treated)	Uni-ZAP XR	LP04
HPHA	Normal Prostate	Uni-ZAP XR	LP04
HPIA HPIB HPIC	LNCAP prostate cell line	Uni-ZAP XR	LP04
HPJA HPJB HPJC	PC3 Prostate cell line	Uni-ZAP XR	LP04
HOSE HOSF HOSG	Human Osteoclastoma, re-excision	Uni-ZAP XR	LP04
HTGE HTGF	Apoptotic T-cell, re-excision	Uni-ZAP XR	LP04
HMAJ HMAK	H Macrophage (GM-CSF treated), re-excision	Uni-ZAP XR	LP04
HACB HACC HADC	Human Adipose Tissue, re-excision	Uni-ZAP XR	LP04
HFFA	H. Frontal Cortex, Epileptic	Uni-ZAP XR	LP04
HFAA HFAB HFAC HFAD HFAE	Alzheimer's, spongy change	Uni-ZAP XR	LP04

Libraries owned by Catalog	Catalog Description	Vector	ATCC Deposit
HFAM	Frontal Lobe, Dementia	Uni-ZAP XR	LP04
HMIA HMIB HMIC	Human Manic Depression Tissue	Uni-ZAP XR	LP04
HTSA HTSE HTSF HTSG HTSH	Human Thymus	pBS	LP05
HPBA HPBB HPBC HPBD HPBE	Human Pineal Gland	pBS	LP05
HSAA HSAB HSAC	HSA 172 Cells	pBS	LP05
HSBA HSBB HSBC HSBM	HSC172 cells	pBS	LP05
HJAA HJAB HJAC HJAD	Jurkat T-cell G1 phase	pBS	LP05
HJBA HJBB HJBC HJBD	Jurkat T-Cell, S phase	pBS	LP05
HAFB HAFB	Aorta endothelial cells + TNF- $\alpha$	pBS	LP05
HAWA HAWB HAWC	Human White Adipose	pBS	LP05
HTNA HTNB	Human Thyroid	pBS	LP05
HONA	Normal Ovary, Premenopausal	pBS	LP05
HARA HARB	Human Adult Retina	pBS	LP05
HLJA HLJB	Human Lung	pCMVSPORT 1	LP06
HOFM HOFN HOFO	H. Ovarian Tumor, II, OV5232	pCMVSPORT 2.0	LP07
HOGA HOGB HOGC	OV 10-3-95	pCMVSPORT 2.0	LP07
HCGL	CD34+cells, II	pCMVSPORT 2.0	LP07
HDLA	Hodgkin's Lymphoma I	pCMVSPORT 2.0	LP07
HDTA HDTB HDTC HDTD HDTE	Hodgkin's Lymphoma II	pCMVSPORT 2.0	LP07
HKAA HKAB HKAC HKAD HKAE HKAF HKAG HKAH	Keratinocyte	pCMVSPORT2.0	LP07
HCIM	CAPFINDER, Crohn's Disease, lib 2	pCMVSPORT 2.0	LP07
HKAL	Keratinocyte, lib 2	pCMVSPORT2.0	LP07
HKAT	Keratinocyte, lib 3	pCMVSPORT2.0	LP07
HNDA	Nasal polyps	pCMVSPORT2.0	LP07
HDRA	H. Primary Dendritic Cells, lib 3	pCMVSPORT2.0	LP07
HOHA HOHB HOHC	Human Osteoblasts II	pCMVSPORT2.0	LP07
HLDA HLDB HLDC	Liver, Hepatoma	pCMVSPORT3.0	LP08
HLDN HLDO HLDP	Human Liver, normal	pCMVSPORT3.0	LP08
HMTA	pBMC stimulated w/ poly I/C	pCMVSPORT3.0	LP08
HNTA	NTERA2, control	pCMVSPORT3.0	LP08
HDP A HDPB HDP C HDPD HDPF HDPG HDPH HDPI HDPI HDPK	Primary Dendritic Cells, lib 1	pCMVSPORT3.0	LP08
HDP M HDP N HDP O HDP P	Primary Dendritic cells, frac 2	pCMVSPORT3.0	LP08
HMUA HMUB HMUC	Myeloid Progenitor Cell Line	pCMVSPORT3.0	LP08
HHEA HHEB HHEC HHED	T Cell helper I	pCMVSPORT3.0	LP08
HHEM HHEN HHEO HHEP	T cell helper II	pCMVSPORT3.0	LP08
HEQA HEQB HEQC	Human endometrial stromal cells	pCMVSPORT3.0	LP08
HJMA HJMB	Human endometrial stromal cells-treated with progesterone	pCMVSPORT3.0	LP08
HSWA HSWB HSWC	Human endometrial stromal cells-treated with estradiol	pCMVSPORT3.0	LP08
HSYA HSYB HSYC	Human Thymus Stromal Cells	pCMVSPORT3.0	LP08



Libraries owned by Catalog	Catalog Description	Vector	ATCC Deposit
HLWA HLWB HLWC	Human Placenta	pCMVSPORT3.0	LP08
HRAA HRAB HRAC	Rejected Kidney, lib 4	pCMVSPORT3.0	LP08
HMTM	PCR, pBMC I/C treated	PCR II	LP09
HMJA	H. Meningioma, M6	pSport 1	LP10
HMKA HMKB HMKC HMKD HMKE	H. Meningioma, M1	pSport 1	LP10
HUSG HUSI	Human umbilical vein endothelial cells, IL-4 induced	pSport 1	LP10
HUSX HUSY	Human Umbilical Vein Endothelial Cells, uninduced	pSport 1	LP10
HOFA	Ovarian Tumor I, OV5232	pSport 1	LP10
HCFA HCFB HCFC HCFC	T-Cell PHA 16 hrs	pSport 1	LP10
HCFL HCFM HCFN HCFO	T-Cell PHA 24 hrs	pSport 1	LP10
HADA HADC HADD HADE HADF HADG	Human Adipose	pSport 1	LP10
HOVA HOVB HOVC	Human Ovary	pSport 1	LP10
HTWB HTWC HTWD HTWE HTWF	Resting T-Cell Library, II	pSport 1	LP10
HMMA	Spleen metastatic melanoma	pSport 1	LP10
HLYA HLYB HLYC HLYD HLYE	Spleen, Chronic lymphocytic leukemia	pSport 1	LP10
HCGA	CD34+ cell, I	pSport 1	LP10
HEOM HEON	Human Eosinophils	pSport 1	LP10
HTDA	Human Tonsil, Lib 3	pSport 1	LP10
HSPA	Salivary Gland, Lib 2	pSport 1	LP10
HCHA HCHB HCHC	Breast Cancer cell line, MDA 36	pSport 1	LP10
HCHM HCHN	Breast Cancer Cell line, angiogenic	pSport 1	LP10
HCIA	Crohn's Disease	pSport 1	LP10
HDAA HDAB HDAC	HEL cell line	pSport 1	LP10
HABA	Human Astrocyte	pSport 1	LP10
HUFA HUFB HUFC	Ulcerative Colitis	pSport 1	LP10
HNTM	NTERA2 + retinoic acid, 14 days	pSport 1	LP10
HDQA	Primary Dendritic cells, CapFinder2, frac 1	pSport 1	LP10
HDQM	Primary Dendritic Cells, CapFinder, frac 2	pSport 1	LP10
HLDX	Human Liver, normal, CapFinder	pSport 1	LP10
HULA HULB HULC	Human Dermal Endothelial Cells, untreated	pSport 1	LP10
HUMA	Human Dermal Endothelial cells, treated	pSport 1	LP10
HCJA	Human Stromal Endometrial fibroblasts, untreated	pSport 1	LP10
HCJM	Human Stromal endometrial fibroblasts, treated w/ estradiol	pSport 1	LP10
HEDA	Human Stromal endometrial fibroblasts, treated with progesterone	pSport 1	LP10

Libraries owned by Catalog	Catalog Description	Vector	ATCC Deposit
HFNA	Human ovary tumor cell OV350721	pSport1	LP10
HKGA HKGB HKGC HKGD	Merkel Cells	pSport1	LP10
HISA HISB HISC	Pancreas Islet Cell Tumor	pSport1	LP10
HLSA	Skin, burned	pSport1	LP10
HBZA	Prostate,BPH, Lib 2	pSport 1	LP10
HBZS	Prostate BPH,Lib 2, subtracted	pSport 1	LP10
HFIA HFIB HFIC	Synovial Fibroblasts (control)	pSport 1	LP10
HFII HFII HFII	Synovial hypoxia	pSport 1	LP10
HFII HFII HFII	Synovial IL-1/TNF stimulated	pSport 1	LP10
HGCA	Mesangial cell, frac 1	pSport1	LP10
HMVA HMVB HMVC	Bone Marrow Stromal Cell, untreated	pSport1	LP10
HFIX HFII HFIZ	Synovial Fibroblasts (II/TNF), subt	pSport1	LP10
HFOX HFOY HFOZ	Synovial hypoxia-RSF subtracted	pSport1	LP10
HMQA HMQB HMQC HMQD	Human Activated Monocytes	Uni-ZAP XR	LP11
HLIA HLIB HLIC	Human Liver	pCMVSPORT 1	LP012
HHBA HHBB HHBC HHBD HHBE	Human Heart	pCMVSPORT 1	LP012
HBBA HBBB	Human Brain	pCMVSPORT 1	LP012
HLJA HLJB HLJC HLJD HLJE	Human Lung	pCMVSPORT 1	LP012
HOGA HOGB HOGC	Ovarian Tumor	pCMVSPORT 2.0	LP012
HTJM	Human Tonsils, Lib 2	pCMVSPORT 2.0	LP012
HAMF HAMG	KMH2	pCMVSPORT 3.0	LP012
HAJA HAJB HAJC	L428	pCMVSPORT 3.0	LP012
HWBA HWBB HWBC HWBD HWBE	Dendritic cells, pooled	pCMVSPORT 3.0	LP012
HWAA HWAB HWAC HWAD HWAE	Human Bone Marrow, treated	pCMVSPORT 3.0	LP012
HYAA HYAB HYAC	B Cell lymphoma	pCMVSPORT 3.0	LP012
HWHG HWHH HWHI	Healing groin wound, 6.5 hours post incision	pCMVSPORT 3.0	LP012
HWHP HWHQ HWHR	Healing groin wound; 7.5 hours post incision	pCMVSPORT 3.0	LP012
HARM	Healing groin wound - zero hr post-incision (control)	pCMVSPORT 3.0	LP012
HBIM	Olfactory epithelium; nasalcavity	pCMVSPORT 3.0	LP012
HWDA	Healing Abdomen wound; 70&90 min post incision	pCMVSPORT 3.0	LP012
HWEA	Healing Abdomen Wound;15 days post incision	pCMVSPORT 3.0	LP012
HWJA	Healing Abdomen Wound;21&29 days	pCMVSPORT 3.0	LP012
HNAL	Human Tongue, frac 2	pSport1	LP012
HMJA	H. Meningima, M6	pSport1	LP012
HMKA HMKB HMKC HMKD HMKE	H. Meningima, M1	pSport1	LP012

Libraries owned by Catalog	Catalog Description	Vector	ATCC Deposit
HOFA	Ovarian Tumor I, OV5232	pSport1	LP012
HCFA HCFB HCFC HCFD	T-Cell PHA 16 hrs	pSport1	LP012
HCFL HCFM HCFN HCFO	T-Cell PHA 24 hrs	pSport1	LP012
HMMA HMMB HMMC	Spleen metastatic melanoma	pSport1	LP012
HTDA	Human Tonsil, Lib 3	pSport1	LP012
HDBA	Human Fetal Thymus	pSport1	LP012
HDUA	Pericardium	pSport1	LP012
HBZA	Prostate, BPH, Lib 2	pSport1	LP012
HWCA	Larynx tumor	pSport1	LP012
HWKA	Normal lung	pSport1	LP012
HSMB	Bone marrow stroma, treated	pSport1	LP012
HBHM	Normal trachea	pSport1	LP012
HLFC	Human Larynx	pSport1	LP012
HLRB	Siebben Polypsis	pSport1	LP012
HNIA	Mammary Gland	pSport1	LP012
HNJB	Palate carcinoma	pSport1	LP012
HNKA	Palate normal	pSport1	LP012
HMZA	Pharynx carcinoma	pSport1	LP012
HABG	Cheek Carcinoma	pSport1	LP012
HMZM	Pharynx Carcinoma	pSport1	LP012
HDRM	Larynx Carcinoma	pSport1	LP012
HVAA	Pancreas normal PCA4 No	pSport1	LP012
HICA	Tongue carcinoma	pSport1	LP012
HUKA HUKB HUKC HUKD HUKF	Human Uterine Cancer	Lambda ZAP II	LP013
HFFA	Human Fetal Brain, random primed	Lambda ZAP II	LP013
HTUA	Activated T-cell labeled with 4-thiouridine	Lambda ZAP II	LP013
HBQA	Early Stage Human Brain, random primed	Lambda ZAP II	LP013
HMEB	Human microvascular Endothelial cells, fract. B	Lambda ZAP II	LP013
HUSH	Human Umbilical Vein Endothelial cells, fract. A, re-excision	Lambda ZAP II	LP013
HLQC HLQD	Hepatocellular tumor, re-excision	Lambda ZAP II	LP013
HTWJ HTWK HTWL	Resting T-cell, re-excision	Lambda ZAP II	LP013
HF6S	Human Whole 6 week Old Embryo (II), sub	pBluescript	LP013
HHPS	Human Hippocampus, subtracted	pBluescript	LP013
HLIS	LNCAP, differential expression	pBluescript	LP013
HLHS HLHT	Early Stage Human Lung, Subtracted	pBluescript	LP013
HSUS	Supt cells, cyclohexamide treated, subtracted	pBluescript	LP013
HSUT	Supt cells, cyclohexamide treated, differentially expressed	pBluescript	LP013

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Libraries owned by Catalog	Catalog Description	Vector	ATCC Deposit
HTRA	Human Trachea Tumor	Uni-ZAP XR	LP013
HE2A HE2D HE2E HE2H HE2I	12 Week Old Early Stage Human	Uni-ZAP XR	LP013
HE2B HE2C HE2F HE2G HE2P	12 Week Old Early Stage Human, II	Uni-ZAP XR	LP013
HNEA HNEB HNEC HNED HNEE	Human Neutrophil	Uni-ZAP XR	LP013
HBGA	Human Primary Breast Cancer	Uni-ZAP XR	LP013
HPTS HPTT HPTU	Human Pituitary, subtracted	Uni-ZAP XR	LP013
HMQA HMQB HMQC HMQD	Human Activated Monocytes	Uni-ZAP XR	LP013
HOAA HOAB HOAC	Human Osteosarcoma	Uni-ZAP XR	LP013
HTOA HTOD HTOE HTOF HTOG	human tonsils	Uni-ZAP XR	LP013
HMGB	Human OB MG63 control fraction I	Uni-ZAP XR	LP013
HOPB	Human OB HOS control fraction I	Uni-ZAP XR	LP013
HOQB	Human OB HOS treated (1 nM E2) fraction I	Uni-ZAP XR	LP013
HAUA HAUB HAUC	Amniotic Cells - TNF induced	Uni-ZAP XR	LP013
HAQA HAQB HAQC HAQD	Amniotic Cells - Primary Culture	Uni-ZAP XR	LP013
HROA HROC	HUMAN STOMACH	Uni-ZAP XR	LP013
HBJA HBJB HBJC HBJD HBJE	HUMAN B CELL LYMPHOMA	Uni-ZAP XR	LP013
HODA HODB HODC HODD	human ovarian cancer	Uni-ZAP XR	LP013
HCPA	Corpus Callosum	Uni-ZAP XR	LP013
HSOA	stomach cancer (human)	Uni-ZAP XR	LP013
HERA	SKIN	Uni-ZAP XR	LP013
HMDA	Brain-medulloblastoma	Uni-ZAP XR	LP013
HGLA HGLB HGLD	Glioblastoma	Uni-ZAP XR	LP013
HWTA HWTB HWTC	wilm's tumor	Uni-ZAP XR	LP013
HEAA	H. Atrophic Endometrium	Uni-ZAP XR	LP013
HAPN HAPO HAPF HAPQ HAPR	Human Adult Pulmonary;re-excision	Uni-ZAP XR	LP013
HLTG HLTH	Human T-cell lymphoma;re-excision	Uni-ZAP XR	LP013
HAHC HAHD HAHE	Human Adult Heart;re-excision	Uni-ZAP XR	LP013
HAGA HAGB HAGC HAGD HAGE	Human Amygdala	Uni-ZAP XR	LP013
HSJA HSJB HSJC	Smooth muscle-ILb induced	Uni-ZAP XR	LP013
HSJA HSHB HSHC	Smooth muscle, IL1b induced	Uni-ZAP XR	LP013
HPWA HPWB HPWC HPWD HPWE	Prostate BPH	Uni-ZAP XR	LP013
HPIA HPIB HPIC	LNCAP prostate cell line	Uni-ZAP XR	LP013
HPJA HPJB HPJC	PC3 Prostate cell line	Uni-ZAP XR	LP013
HBTA	Bone Marrow Stroma, TNF&LPS ind	Uni-ZAP XR	LP013
HMCF HMCB HMCH HMCJ	Macrophage-oxLDL; re-excision	Uni-ZAP XR	LP013

Libraries owned by Catalog	Catalog Description	Vector	ATCC Deposit
HAGG HAGH HAGI	Human Amygdala;re-excision	Uni-ZAP XR	LP013
HACA	H. Adipose Tissue	Uni-ZAP XR	LP013
HKFB	K562 + PMA (36 hrs),re-excision	ZAP Express	LP013
HCWT HCWU HCWV	CD34 positive cells (cord blood),re-ex	ZAP Express	LP013
HBWA	Whole brain	ZAP Express	LP013
HBXA HBXB HBXC HBXD	Human Whole Brain #2 - Oligo dT > 1.5Kb	ZAP Express	LP013
HAVM	Temporal cortex-Alzheimer	pT-Adv	LP014
HAVT	Hippocampus, Alzheimer Subtracted	pT-Adv	LP014
HHAS	CHME Cell Line	Uni-ZAP XR	LP014
HAJR	Larynx normal	pSport 1	LP014
HWLE HWLF HWLG HWLH	Colon Normal	pSport 1	LP014
HCRM HCRN HCRO	Colon Carcinoma	pSport 1	LP014
HWLI HWLJ HWLK	Colon Normal	pSport 1	LP014
HWLQ HWLR HWLS HWLT	Colon Tumor	pSport 1	LP014
HBFM	Gastrocnemius Muscle	pSport 1	LP014
HBOD HBOE	Quadriceps Muscle	pSport 1	LP014
HBKD HBKE	Soleus Muscle	pSport 1	LP014
HCCM	Pancreatic Langerhans	pSport 1	LP014
HWGA	Larynx carcinoma	pSport 1	LP014
HWGM HWGN	Larynx carcinoma	pSport 1	LP014
HWLA HWLB HWLC	Normal colon	pSport 1	LP014
HWLM HWLN	Colon Tumor	pSport 1	LP014
HVAM HVAN HVAO	Pancreas Tumor	pSport 1	LP014
HWGQ	Larynx carcinoma	pSport 1	LP014
HAQM HAQN	Salivary Gland	pSport 1	LP014
HASM	Stomach; normal	pSport 1	LP014
HBCM	Uterus; normal	pSport 1	LP014
HCDM	Testis; normal	pSport 1	LP014
HDJM	Brain; normal	pSport 1	LP014
HEFM	Adrenal Gland,normal	pSport 1	LP014
HBAA	Rectum normal	pSport 1	LP014
HFDM	Rectum tumour	pSport 1	LP014
HGAM	Colon, normal	pSport 1	LP014
HHMM	Colon, tumour	pSport 1	LP014
HCLB HCLC	Human Lung Cancer	Lambda Zap II	LP015
HRLA	L1 Cell line	ZAP Express	LP015
HHAM	Hypothalamus, Alzheimer's	pCMVSPORT 3.0	LP015
HKBA	Ku 812F Basophils Line	pSport 1	LP015
HS2S	Saos2, Dexamethosone Treated	pSport 1	LP016
HA5A	Lung Carcinoma A549 TNFalpha activated	pSport 1	LP016
HTFM	TF-1 Cell Line GM-CSF Treated	pSport 1	LP016
HYAS	Thyroid Tumour	pSport 1	LP016
HUTS	Larynx Normal	pSport 1	LP016
HXOA	Larynx Tumor	pSport 1	LP016
HEAH	Ea.hy.926 cell line	pSport 1	LP016

Libraries owned by Catalog	Catalog Description	Vector	ATCC Deposit
HINA	Adenocarcinoma Human	pSport 1	LP016
HRMA	Lung Mesothelium	pSport 1	LP016
HLCL	Human Pre-Differentiated Adipocytes	Uni-Zap XR	LP017
HS2A	Saos2 Cells	pSport 1	LP020
HS2I	Saos2 Cells; Vitamin D3 Treated	pSport 1	LP020
HUCM	CHME Cell Line, untreated	pSport 1	LP020
HEPN	Aryepiglottis Normal	pSport 1	LP020
HPSN	Sinus Piniformis Tumour	pSport 1	LP020
HNSA	Stomach Normal	pSport 1	LP020
HNSM	Stomach Tumour	pSport 1	LP020
HNLA	Liver Normal Met5No	pSport 1	LP020
HUTA	Liver Tumour Met 5 Tu	pSport 1	LP020
HOCN	Colon Normal	pSport 1	LP020
HOCT	Colon Tumor	pSport 1	LP020
HTNT	Tongue Tumour	pSport 1	LP020
HLXN	Larynx Normal	pSport 1	LP020
HLXT	Larynx Tumour	pSport 1	LP020
HTYN	Thymus	pSport 1	LP020
HPLN	Placenta	pSport 1	LP020
HTNG	Tongue Normal	pSport 1	LP020
HZAA	Thyroid Normal (SDCA2 No)	pSport 1	LP020
HWES	Thyroid Thyroiditis	pSport 1	LP020
HFHD	Ficoll Human Stromal Cells, 5Fu treated	pTrip1Ex2	LP021
HFHM, HFHN	Ficoll Human Stromal Cells, Untreated	pTrip1Ex2	LP021
HPCI	Hep G2 Cells, lambda library	lambda Zap-CMV XR	LP021
HBCA, HBCB, HBCC	H. Lymph node breast Cancer	Uni-ZAP XR	LP021
HCOK	Chondrocytes	pSPORT1	LP022
HDCA, HDCB, HDCC	Dendritic Cells From CD34 Cells	pSPORT1	LP022
HDMA, HDMB	CD40 activated monocyte dendritic cells	pSPORT1	LP022
HDDM, HDDN, HDDO	LPS activated derived dendritic cells	pSPORT1	LP022
HPCR	Hep G2 Cells, PCR library	lambda Zap-CMV XR	LP022
HAAA, HAAB, HAAC	Lung, Cancer (4005313A3): Invasive Poorly Differentiated Lung Adenocarcinoma	pSPORT1	LP022
HIPA, HIPB, HIPC	Lung, Cancer (4005163 B7): Invasive, Poorly Diff. Adenocarcinoma, Metastatic	pSPORT1	LP022
HOOH, HOOI	Ovary, Cancer: (4004562 B6) Papillary Serous Cystic Neoplasm, Low Malignant Pot	pSPORT1	LP022
HIDA	Lung, Normal: (4005313 B1)	pSPORT1	LP022
HUJA, HUJB, HUJC, HUJD, HUJ	B-Cells	pCMVSPORT 3.0	LP022

Libraries owned by Catalog	Catalog Description	Vector	ATCC Deposit
E			
HNOA,HNOB,HNOC,HNOD	Ovary, Normal: (9805C040R)	pSPORT1	LP022
HNLM	Lung, Normal: (4005313 B1)	pSPORT1	LP022
HSCL	Stromal Cells	pSPORT1	LP022
HAAX	Lung, Cancer: (4005313 A3) Invasive Poorly-differentiated Metastatic lung adenocarcinoma	pSPORT1	LP022
HUUA,HUUB,HUUC,HUUD	B-cells (unstimulated)	pTriplEx2	LP022
HWWA,HWWB,HWWC,HWW D,HWWE,HWWF,HWWG	B-cells (stimulated)	pSPORT1	LP022
HCCC	Colon, Cancer: (9808C064R)	pCMVSPORT 3.0	LP023
HPDO HPDP HPDQ HPDR HPD	Ovary, Cancer (9809C332): Poorly differentiated adenocarcinoma	pSport 1	LP023
HPCO HPCP HPCQ HPCT	Ovary, Cancer (15395A1F): Grade II Papillary Carcinoma	pSport 1	LP023
HOCM HOCO HOCF HOCQ	Ovary, Cancer: (15799A1F) Poorly differentiated carcinoma	pSport 1	LP023
HCBM HCBN HCBO	Breast, Cancer: (4004943 A5)	pSport 1	LP023
HNBT HNBU HNBV	Breast, Normal: (4005522B2)	pSport 1	LP023
HBCP HBCQ	Breast, Cancer: (4005522 A2)	pSport 1	LP023
HBCJ	Breast, Cancer: (9806C012R)	pSport 1	LP023
HSAM HSAN	Stromal cells 3.88	pSport 1	LP023
HVCA HVCB HVCC HVCD	Ovary, Cancer: (4004332 A2)	pSport 1	LP023
HSCK HSEN HSEO	Stromal cells (HBM3.18)	pSport 1	LP023
HSCP HSCQ	stromal cell clone 2.5	pSport 1	LP023
HUXA	Breast Cancer: (4005385 A2)	pSport 1	LP023
HCOM HCON HCOO HCOP HCOQ	Ovary, Cancer (4004650 A3): Well-Differentiated Micropapillary Serous Carcinoma	pSport 1	LP023
HBNM	Breast, Cancer: (9802C020E)	pSport 1	LP023
HVVA HVVB HVVC HVVD HVVE	Human Bone Marrow, treated	pSport 1	LP023

Two nonlimiting examples are provided below for isolating a particular clone from the deposited sample of plasmid cDNAs cited for that clone in Table 7. First, a plasmid is directly  
5 isolated by screening the clones using a polynucleotide probe corresponding to the nucleotide sequence of SEQ ID NO:X.

Particularly, a specific polynucleotide with 30-40 nucleotides is synthesized using an Applied Biosystems DNA synthesizer according to the sequence reported. The oligonucleotide is labeled, for instance, with <sup>32</sup>P-γ-ATP using T4 polynucleotide kinase and purified according to  
10 routine methods. (E.g., Maniatis et al., Molecular Cloning: A Laboratory Manual, Cold Spring Harbor Press, Cold Spring, NY (1982)). The plasmid mixture is transformed into a suitable host, as indicated above (such as XL-1 Blue (Stratagene)) using techniques known to those of skill in



the art, such as those provided by the vector supplier or in related publications or patents cited above. The transformants are plated on 1.5% agar plates (containing the appropriate selection agent, e.g., ampicillin) to a density of about 150 transformants (colonies) per plate. These plates are screened using Nylon membranes according to routine methods for bacterial colony screening  
5 (e.g., Sambrook et al., *Molecular Cloning: A Laboratory Manual*, 2nd Edit., (1989), Cold Spring Harbor Laboratory Press, pages 1.93 to 1.104), or other techniques known to those of skill in the art.

Alternatively, two primers of 17-20 nucleotides derived from both ends of the nucleotide sequence of SEQ ID NO:X are synthesized and used to amplify the desired cDNA  
10 using the deposited cDNA plasmid as a template. The polymerase chain reaction is carried out under routine conditions, for instance, in 25  $\mu$ l of reaction mixture with 0.5  $\mu$ g of the above cDNA template. A convenient reaction mixture is 1.5-5 mM  $MgCl_2$ , 0.01% (w/v) gelatin, 20  $\mu$ M each of dATP, dCTP, dGTP, dTTP, 25 pmol of each primer and 0.25 Unit of Taq polymerase. Thirty five cycles of PCR (denaturation at 94°C for 1 min; annealing at 55°C for 1 min; elongation at 72°C  
15 for 1 min) are performed with a Perkin-Elmer Cetus automated thermal cycler. The amplified product is analyzed by agarose gel electrophoresis and the DNA band with expected molecular weight is excised and purified. The PCR product is verified to be the selected sequence by subcloning and sequencing the DNA product.

Several methods are available for the identification of the 5' or 3' non-coding portions  
20 of a gene which may not be present in the deposited clone. These methods include but are not limited to, filter probing, clone enrichment using specific probes, and protocols similar or identical to 5' and 3' "RACE" protocols which are well known in the art. For instance, a method similar to 5' RACE is available for generating the missing 5' end of a desired full-length transcript. (Fromont-Racine et al., *Nucleic Acids Res.* 21(7):1683-1684 (1993)).

Briefly, a specific RNA oligonucleotide is ligated to the 5' ends of a population of  
25 RNA presumably containing full-length gene RNA transcripts. A primer set containing a primer specific to the ligated RNA oligonucleotide and a primer specific to a known sequence of the gene of interest is used to PCR amplify the 5' portion of the desired full-length gene. This amplified product may then be sequenced and used to generate the full length gene.

This above method starts with total RNA isolated from the desired source, although  
30 poly-A+ RNA can be used. The RNA preparation can then be treated with phosphatase if necessary to eliminate 5' phosphate groups on degraded or damaged RNA which may interfere with the later RNA ligase step. The phosphatase should then be inactivated and the RNA treated with tobacco acid pyrophosphatase in order to remove the cap structure present at the 5' ends of  
35 messenger RNAs. This reaction leaves a 5' phosphate group at the 5' end of the cap cleaved RNA which can then be ligated to an RNA oligonucleotide using T4 RNA ligase.

This modified RNA preparation is used as a template for first strand cDNA synthesis using a gene specific oligonucleotide. The first strand synthesis reaction is used as a template for PCR amplification of the desired 5' end using a primer specific to the ligated RNA oligonucleotide and a primer specific to the known sequence of the gene of interest. The resultant product is then sequenced and analyzed to confirm that the 5' end sequence belongs to the desired gene.

***Example 2: Isolation of Genomic Clones Corresponding to a Polynucleotide***

A human genomic P1 library (Genomic Systems, Inc.) is screened by PCR using primers selected for the sequence corresponding to SEQ ID NO:X according to the method described in Example 1. (See also, Sambrook.)

***Example 3: Tissue specific expression analysis***

The Human Genome Sciences, Inc. (HGS) database is derived from sequencing tissue and/or disease specific cDNA libraries. Libraries generated from a particular tissue are selected and the specific tissue expression pattern of EST groups or assembled contigs within these libraries is determined by comparison of the expression patterns of those groups or contigs within the entire database. ESTs and assembled contigs which show tissue specific expression are selected.

The original clone from which the specific EST sequence was generated, or in the case of an assembled contig, the clone from which the 5' most EST sequence was generated, is obtained from the catalogued library of clones and the insert amplified by PCR using methods known in the art. The PCR product is denatured and then transferred in 96 or 384 well format to a nylon membrane (Schleicher and Schuell) generating an array filter of tissue specific clones. Housekeeping genes, maize genes, and known tissue specific genes are included on the filters. These targets can be used in signal normalization and to validate assay sensitivity. Additional targets are included to monitor probe length and specificity of hybridization.

Radioactively labeled hybridization probes are generated by first strand cDNA synthesis per the manufacturer's instructions (Life Technologies) from mRNA/RNA samples prepared from the specific tissue being analyzed (e.g., prostate, prostate cancer, ovarian, ovarian cancer, etc.). The hybridization probes are purified by gel exclusion chromatography, quantitated, and hybridized with the array filters in hybridization bottles at 65°C overnight. The filters are washed under stringent conditions and signals are captured using a Fuji phosphorimager.

Data is extracted using AIS software and following background subtraction, signal normalization is performed. This includes a normalization of filter-wide expression levels between different experimental runs. Genes that are differentially expressed in the tissue of interest are identified.

**Example 4: Chromosomal Mapping of the Polynucleotides**

An oligonucleotide primer set is designed according to the sequence at the 5' end of SEQ ID NO:X. This primer preferably spans about 100 nucleotides. This primer set is then used in a polymerase chain reaction under the following set of conditions: 30 seconds, 95°C; 1 minute, 56°C; 1 minute, 70°C. This cycle is repeated 32 times followed by one 5 minute cycle at 70°C. Human, mouse, and hamster DNA is used as template in addition to a somatic cell hybrid panel containing individual chromosomes or chromosome fragments (Bios, Inc). The reactions are analyzed on either 8% polyacrylamide gels or 3.5 % agarose gels. Chromosome mapping is determined by the presence of an approximately 100 bp PCR fragment in the particular somatic cell hybrid.

**Example 5: Bacterial Expression of a Polypeptide**

A polynucleotide encoding a polypeptide of the present invention is amplified using PCR oligonucleotide primers corresponding to the 5' and 3' ends of the DNA sequence, as outlined in Example 1, to synthesize insertion fragments. The primers used to amplify the cDNA insert should preferably contain restriction sites, such as BamHI and XbaI, at the 5' end of the primers in order to clone the amplified product into the expression vector. For example, BamHI and XbaI correspond to the restriction enzyme sites on the bacterial expression vector pQE-9. (Qiagen, Inc., Chatsworth, CA). This plasmid vector encodes antibiotic resistance (Amp<sup>r</sup>), a bacterial origin of replication (ori), an IPTG-regulatable promoter/operator (P/O), a ribosome binding site (RBS), a 6-histidine tag (6-His), and restriction enzyme cloning sites.

The pQE-9 vector is digested with BamHI and XbaI and the amplified fragment is ligated into the pQE-9 vector maintaining the reading frame initiated at the bacterial RBS. The ligation mixture is then used to transform the E. coli strain M15/rep4 (Qiagen, Inc.) which contains multiple copies of the plasmid pREP4, which expresses the lacI repressor and also confers kanamycin resistance (Kan<sup>r</sup>). Transformants are identified by their ability to grow on LB plates and ampicillin/kanamycin resistant colonies are selected. Plasmid DNA is isolated and confirmed by restriction analysis.

Clones containing the desired constructs are grown overnight (O/N) in liquid culture in LB media supplemented with both Amp (100 ug/ml) and Kan (25 ug/ml). The O/N culture is used to inoculate a large culture at a ratio of 1:100 to 1:250. The cells are grown to an optical density 600 (O.D.<sup>600</sup>) of between 0.4 and 0.6. IPTG (Isopropyl-B-D-thiogalacto pyranoside) is then added to a final concentration of 1 mM. IPTG induces by inactivating the lacI repressor, clearing the P/O leading to increased gene expression.

Cells are grown for an extra 3 to 4 hours. Cells are then harvested by centrifugation (20 mins at 6000Xg). The cell pellet is solubilized in the chaotropic agent 6 Molar Guanidine HCl by stirring for 3-4 hours at 4°C. The cell debris is removed by centrifugation, and the supernatant containing the polypeptide is loaded onto a nickel-nitrilo-tri-acetic acid ("Ni-NTA") affinity resin column (available from QIAGEN, Inc., *supra*). Proteins with a 6 x His tag bind to the Ni-NTA resin with high affinity and can be purified in a simple one-step procedure (for details see: The QIAexpressionist (1995) QIAGEN, Inc., *supra*).

Briefly, the supernatant is loaded onto the column in 6 M guanidine-HCl, pH 8. The column is first washed with 10 volumes of 6 M guanidine-HCl, pH 8, then washed with 10 volumes of 6 M guanidine-HCl pH 6, and finally the polypeptide is eluted with 6 M guanidine-HCl, pH 5.

The purified protein is then renatured by dialyzing it against phosphate-buffered saline (PBS) or 50 mM Na-acetate, pH 6 buffer plus 200 mM NaCl. Alternatively, the protein can be successfully refolded while immobilized on the Ni-NTA column. The recommended conditions are as follows: renature using a linear 6M-1M urea gradient in 500 mM NaCl, 20% glycerol, 20 mM Tris/HCl pH 7.4, containing protease inhibitors. The renaturation should be performed over a period of 1.5 hours or more. After renaturation the proteins are eluted by the addition of 250 mM imidazole. Imidazole is removed by a final dialyzing step against PBS or 50 mM sodium acetate pH 6 buffer plus 200 mM NaCl. The purified protein is stored at 4°C or frozen at -80°C.

In addition to the above expression vector, the present invention further includes an expression vector, called pHE4a (ATCC Accession Number 209645, deposited on February 25, 1998) which contains phage operator and promoter elements operatively linked to a polynucleotide of the present invention, called pHE4a. (ATCC Accession Number 209645, deposited on February 25, 1998.) This vector contains: 1) a neomycinphosphotransferase gene as a selection marker, 2) an E. coli origin of replication, 3) a T5 phage promoter sequence, 4) two lac operator sequences, 5) a Shine-Delgarno sequence, and 6) the lactose operon repressor gene (*lacIq*). The origin of replication (*oriC*) is derived from pUC19 (LTI, Gaithersburg, MD). The promoter and operator sequences are made synthetically.

DNA can be inserted into the pHE4a by restricting the vector with NdeI and XbaI, BamHI, XhoI, or Asp718, running the restricted product on a gel, and isolating the larger fragment (the stuffer fragment should be about 310 base pairs). The DNA insert is generated according to the PCR protocol described in Example 1, using PCR primers having restriction sites for NdeI (5' primer) and XbaI, BamHI, XhoI, or Asp718 (3' primer). The PCR insert is gel purified and restricted with compatible enzymes. The insert and vector are ligated according to standard protocols.

The engineered vector could easily be substituted in the above protocol to express protein in a bacterial system.

**Example 6: Purification of a Polypeptide from an Inclusion Body**

5       The following alternative method can be used to purify a polypeptide expressed in *E. coli* when it is present in the form of inclusion bodies. Unless otherwise specified, all of the following steps are conducted at 4-10°C.

10       Upon completion of the production phase of the *E. coli* fermentation, the cell culture is cooled to 4-10°C and the cells harvested by continuous centrifugation at 15,000 rpm (Heraeus Sepatech). On the basis of the expected yield of protein per unit weight of cell paste and the amount of purified protein required, an appropriate amount of cell paste, by weight, is suspended in a buffer solution containing 100 mM Tris, 50 mM EDTA, pH 7.4. The cells are dispersed to a homogeneous suspension using a high shear mixer.

15       The cells are then lysed by passing the solution through a microfluidizer (Microfluidics, Corp. or APV Gaulin, Inc.) twice at 4000-6000 psi. The homogenate is then mixed with NaCl solution to a final concentration of 0.5 M NaCl, followed by centrifugation at 7000 xg for 15 min. The resultant pellet is washed again using 0.5M NaCl, 100 mM Tris, 50 mM EDTA, pH 7.4.

20       The resulting washed inclusion bodies are solubilized with 1.5 M guanidine hydrochloride (GuHCl) for 2-4 hours. After 7000 xg centrifugation for 15 min., the pellet is discarded and the polypeptide containing supernatant is incubated at 4°C overnight to allow further GuHCl extraction.

25       Following high speed centrifugation (30,000 xg) to remove insoluble particles, the GuHCl solubilized protein is refolded by quickly mixing the GuHCl extract with 20 volumes of buffer containing 50 mM sodium, pH 4.5, 150 mM NaCl, 2 mM EDTA by vigorous stirring. The refolded diluted protein solution is kept at 4°C without mixing for 12 hours prior to further purification steps.

30       To clarify the refolded polypeptide solution, a previously prepared tangential filtration unit equipped with 0.16 µm membrane filter with appropriate surface area (e.g., Filtron), equilibrated with 40 mM sodium acetate, pH 6.0 is employed. The filtered sample is loaded onto a cation exchange resin (e.g., Poros HS-50, Perseptive Biosystems). The column is washed with 40 mM sodium acetate, pH 6.0 and eluted with 250 mM, 500 mM, 1000 mM, and 1500 mM NaCl in the same buffer, in a stepwise manner. The absorbance at 280 nm of the effluent is continuously monitored. Fractions are collected and further analyzed by SDS-PAGE.

35       Fractions containing the polypeptide are then pooled and mixed with 4 volumes of water. The diluted sample is then loaded onto a previously prepared set of tandem columns of

strong anion (Poros HQ-50, Perseptive Biosystems) and weak anion (Poros CM-20, Perseptive Biosystems) exchange resins. The columns are equilibrated with 40 mM sodium acetate, pH 6.0. Both columns are washed with 40 mM sodium acetate, pH 6.0, 200 mM NaCl. The CM-20 column is then eluted using a 10 column volume linear gradient ranging from 0.2 M NaCl, 50 mM sodium acetate, pH 6.0 to 1.0 M NaCl, 50 mM sodium acetate, pH 6.5. Fractions are collected under constant A<sub>280</sub> monitoring of the effluent. Fractions containing the polypeptide (determined, for instance, by 16% SDS-PAGE) are then pooled.

The resultant polypeptide should exhibit greater than 95% purity after the above refolding and purification steps. No major contaminant bands should be observed from Comassie blue stained 16% SDS-PAGE gel when 5 µg of purified protein is loaded. The purified protein can also be tested for endotoxin/LPS contamination, and typically the LPS content is less than 0.1 ng/ml according to LAL assays.

***Example 7: Cloning and Expression of a Polypeptide in a Baculovirus Expression System***

In this example, the plasmid shuttle vector pA2 is used to insert a polynucleotide into a baculovirus to express a polypeptide. This expression vector contains the strong polyhedrin promoter of the *Autographa californica* nuclear polyhedrosis virus (AcMNPV) followed by convenient restriction sites such as BamHI, Xba I and Asp718. The polyadenylation site of the simian virus 40 ("SV40") is used for efficient polyadenylation. For easy selection of recombinant virus, the plasmid contains the beta-galactosidase gene from *E. coli* under control of a weak *Drosophila* promoter in the same orientation, followed by the polyadenylation signal of the polyhedrin gene. The inserted genes are flanked on both sides by viral sequences for cell-mediated homologous recombination with wild-type viral DNA to generate a viable virus that express the cloned polynucleotide.

Many other baculovirus vectors can be used in place of the vector above, such as pAc373, pVL941, and pAcIM1, as one skilled in the art would readily appreciate, as long as the construct provides appropriately located signals for transcription, translation, secretion and the like, including a signal peptide and an in-frame AUG as required. Such vectors are described, for instance, in Luckow et al., Virology 170:31-39 (1989).

Specifically, the cDNA sequence contained in the deposited clone, including the AUG initiation codon, is amplified using the PCR protocol described in Example 1. If a naturally occurring signal sequence is used to produce the polypeptide of the present invention, the pA2 vector does not need a second signal peptide. Alternatively, the vector can be modified (pA2 GP) to include a baculovirus leader sequence, using the standard methods described in Summers et al., "A Manual of Methods for Baculovirus Vectors and Insect Cell Culture Procedures," Texas Agricultural Experimental Station Bulletin No. 1555 (1987).

The amplified fragment is isolated from a 1% agarose gel using a commercially available kit ("Geneclean," BIO 101 Inc., La Jolla, Ca.). The fragment then is digested with appropriate restriction enzymes and again purified on a 1% agarose gel.

5 The plasmid is digested with the corresponding restriction enzymes and optionally, can be dephosphorylated using calf intestinal phosphatase, using routine procedures known in the art. The DNA is then isolated from a 1% agarose gel using a commercially available kit ("Geneclean" BIO 101 Inc., La Jolla, Ca.).

10 The fragment and the dephosphorylated plasmid are ligated together with T4 DNA ligase. *E. coli* HB101 or other suitable *E. coli* hosts such as XL-1 Blue (Stratagene Cloning Systems, La Jolla, CA) cells are transformed with the ligation mixture and spread on culture plates. Bacteria containing the plasmid are identified by digesting DNA from individual colonies and analyzing the digestion product by gel electrophoresis. The sequence of the cloned fragment is confirmed by DNA sequencing.

15 Five  $\mu$ g of a plasmid containing the polynucleotide is co-transfected with 1.0  $\mu$ g of a commercially available linearized baculovirus DNA ("BaculoGold™ baculovirus DNA, Pharmingen, San Diego, CA), using the lipofection method described by Felgner et al., Proc. Natl. Acad. Sci. USA 84:7413-7417 (1987). One  $\mu$ g of BaculoGold™ virus DNA and 5  $\mu$ g of the plasmid are mixed in a sterile well of a microtiter plate containing 50  $\mu$ l of serum-free Grace's medium (Life Technologies Inc., Gaithersburg, MD). Afterwards, 10  $\mu$ l Lipofectin plus 90  $\mu$ l  
20 Grace's medium are added, mixed and incubated for 15 minutes at room temperature. Then the transfection mixture is added drop-wise to Sf9 insect cells (ATCC CRL 1711) seeded in a 35 mm tissue culture plate with 1 ml Grace's medium without serum. The plate is then incubated for 5 hours at 27° C. The transfection solution is then removed from the plate and 1 ml of Grace's insect medium supplemented with 10% fetal calf serum is added. Cultivation is then continued at 27° C  
25 for four days.

After four days the supernatant is collected and a plaque assay is performed, as described by Summers and Smith, *supra*. An agarose gel with "Blue Gal" (Life Technologies Inc., Gaithersburg) is used to allow easy identification and isolation of gal-expressing clones, which produce blue-stained plaques. (A detailed description of a "plaque assay" of this type can also be  
30 found in the user's guide for insect cell culture and baculovirology distributed by Life Technologies Inc., Gaithersburg, page 9-10.) After appropriate incubation, blue stained plaques are picked with the tip of a micropipettor (e.g., Eppendorf). The agar containing the recombinant viruses is then resuspended in a microcentrifuge tube containing 200  $\mu$ l of Grace's medium and the suspension containing the recombinant baculovirus is used to infect Sf9 cells seeded in 35 mm  
35 dishes. Four days later the supernatants of these culture dishes are harvested and then they are stored at 4° C.

- To verify the expression of the polypeptide, Sf9 cells are grown in Grace's medium supplemented with 10% heat-inactivated FBS. The cells are infected with the recombinant baculovirus containing the polynucleotide at a multiplicity of infection ("MOI") of about 2. If radiolabeled proteins are desired, 6 hours later the medium is removed and is replaced with SF900 II medium minus methionine and cysteine (available from Life Technologies Inc., Rockville, MD). After 42 hours, 5  $\mu$ Ci of  $^{35}$ S-methionine and 5  $\mu$ Ci  $^{35}$ S-cysteine (available from Amersham) are added. The cells are further incubated for 16 hours and then are harvested by centrifugation. The proteins in the supernatant as well as the intracellular proteins are analyzed by SDS-PAGE followed by autoradiography (if radiolabeled).
- Microsequencing of the amino acid sequence of the amino terminus of purified protein may be used to determine the amino terminal sequence of the produced protein.

***Example 8: Expression of a Polypeptide in Mammalian Cells***

- The polypeptide of the present invention can be expressed in a mammalian cell. A typical mammalian expression vector contains a promoter element, which mediates the initiation of transcription of mRNA, a protein coding sequence, and signals required for the termination of transcription and polyadenylation of the transcript. Additional elements include enhancers, Kozak sequences and intervening sequences flanked by donor and acceptor sites for RNA splicing. Highly efficient transcription is achieved with the early and late promoters from SV40, the long terminal repeats (LTRs) from Retroviruses, e.g., RSV, HTLV1, HIV1 and the early promoter of the cytomegalovirus (CMV). However, cellular elements can also be used (e.g., the human actin promoter).

- Suitable expression vectors for use in practicing the present invention include, for example, vectors such as pSVL and pMSG (Pharmacia, Uppsala, Sweden), pRSVcat (ATCC 37152), pSV2dhfr (ATCC 37146), pBC12MI (ATCC 67109), pCMVSPORT 2.0, and pCMVSPORT 3.0. Mammalian host cells that could be used include, human Hela, 293, H9 and Jurkat cells, mouse NIH3T3 and C127 cells, Cos 1, Cos 7 and CV1, quail QC1-3 cells, mouse L cells and Chinese hamster ovary (CHO) cells.

- Alternatively, the polypeptide can be expressed in stable cell lines containing the polynucleotide integrated into a chromosome. The co-transfection with a selectable marker such as DHFR, gpt, neomycin, or hygromycin allows the identification and isolation of the transfected cells.

- The transfected gene can also be amplified to express large amounts of the encoded protein. The DHFR (dihydrofolate reductase) marker is useful in developing cell lines that carry several hundred or even several thousand copies of the gene of interest. (See, e.g., Alt, F. W., et al., J. Biol. Chem. 253:1357-1370 (1978); Hamlin, J. L. and Ma, C., Biochem. et Biophys. Acta,



1097:107-143 (1990); Page, M. J. and Sydenham, M. A., *Biotechnology* 9:64-68 (1991)). Another useful selection marker is the enzyme glutamine synthase (GS) (Murphy et al., *Biochem J.* 227:277-279 (1991); Bebbington et al., *BioTechnology* 10:169-175 (1992). Using these markers, the mammalian cells are grown in selective medium and the cells with the highest resistance are selected. These cell lines contain the amplified gene(s) integrated into a chromosome. Chinese hamster ovary (CHO) and NSO cells are often used for the production of proteins.

Derivatives of the plasmid pSV2-dhfr (ATCC Accession No. 37146), the expression vectors pC4 (ATCC Accession No. 209646) and pC6 (ATCC Accession No.209647) contain the strong promoter (LTR) of the Rous Sarcoma Virus (Cullen et al., *Molecular and Cellular Biology*, 438-447 (March, 1985)) plus a fragment of the CMV-enhancer (Boshart et al., *Cell* 41:521-530 (1985)). Multiple cloning sites, e.g., with the restriction enzyme cleavage sites BamHI, XbaI and Asp718, facilitate the cloning of the gene of interest. The vectors also contain the 3' intron, the polyadenylation and termination signal of the rat preproinsulin gene, and the mouse DHFR gene under control of the SV40 early promoter.

Specifically, the plasmid pC6, for example, is digested with appropriate restriction enzymes and then dephosphorylated using calf intestinal phosphates by procedures known in the art. The vector is then isolated from a 1% agarose gel.

A polynucleotide of the present invention is amplified according to the protocol outlined in Example 1. If a naturally occurring signal sequence is used to produce the polypeptide of the present invention, the vector does not need a second signal peptide. Alternatively, if a naturally occurring signal sequence is not used, the vector can be modified to include a heterologous signal sequence. (See, e.g., International Publication No. WO 96/34891.)

The amplified fragment is isolated from a 1% agarose gel using a commercially available kit ("Geneclean," BIO 101 Inc., La Jolla, Ca.). The fragment then is digested with appropriate restriction enzymes and again purified on a 1% agarose gel.

The amplified fragment is then digested with the same restriction enzyme and purified on a 1% agarose gel. The isolated fragment and the dephosphorylated vector are then ligated with T4 DNA ligase. *E. coli* HB101 or XL-1 Blue cells are then transformed and bacteria are identified that contain the fragment inserted into plasmid pC6 using, for instance, restriction enzyme analysis.

Chinese hamster ovary cells lacking an active DHFR gene is used for transfection. Five  $\mu$ g of the expression plasmid pC6 or pC4 is cotransfected with 0.5  $\mu$ g of the plasmid pSVneo using lipofectin (Felgner et al., *supra*). The plasmid pSV2-neo contains a dominant selectable marker, the *neo* gene from Tn5 encoding an enzyme that confers resistance to a group of antibiotics including G418. The cells are seeded in alpha minus MEM supplemented with 1 mg/ml G418. After 2 days, the cells are trypsinized and seeded in hybridoma cloning plates

(Greiner, Germany) in alpha minus MEM supplemented with 10, 25, or 50 ng/ml of methotrexate plus 1 mg/ml G418. After about 10-14 days single clones are trypsinized and then seeded in 6-well petri dishes or 10 ml flasks using different concentrations of methotrexate (50 nM, 100 nM, 200 nM, 400 nM, 800 nM). Clones growing at the highest concentrations of methotrexate are then  
5 transferred to new 6-well plates containing even higher concentrations of methotrexate (1  $\mu$ M, 2  $\mu$ M, 5  $\mu$ M, 10 mM, 20 mM). The same procedure is repeated until clones are obtained which grow at a concentration of 100 - 200  $\mu$ M. Expression of the desired gene product is analyzed, for instance, by SDS-PAGE and Western blot or by reversed phase HPLC analysis.

#### 10 *Example 9: Protein Fusions*

The polypeptides of the present invention are preferably fused to other proteins. These fusion proteins can be used for a variety of applications. For example, fusion of the present polypeptides to His-tag, HA-tag, protein A, IgG domains, and maltose binding protein facilitates purification. (See Example 5; see also EP A 394,827; Traunecker, et al., Nature 331:84-86 (1988)).  
15 Similarly, fusion to IgG-1, IgG-3, and albumin increases the half-life time *in vivo*. Nuclear localization signals fused to the polypeptides of the present invention can target the protein to a specific subcellular localization, while covalent heterodimer or homodimers can increase or decrease the activity of a fusion protein. Fusion proteins can also create chimeric molecules having more than one function. Finally, fusion proteins can increase solubility and/or stability of  
20 the fused protein compared to the non-fused protein. All of the types of fusion proteins described above can be made by modifying the following protocol, which outlines the fusion of a polypeptide to an IgG molecule, or the protocol described in Example 5.

Briefly, the human Fc portion of the IgG molecule can be PCR amplified, using primers that span the 5' and 3' ends of the sequence described below. These primers also should  
25 have convenient restriction enzyme sites that will facilitate cloning into an expression vector, preferably a mammalian expression vector.

For example, if pC4 (ATCC Accession No. 209646) is used, the human Fc portion can be ligated into the BamHI cloning site. Note that the 3' BamHI site should be destroyed. Next, the vector containing the human Fc portion is re-restricted with BamHI, linearizing the vector, and  
30 a polynucleotide of the present invention, isolated by the PCR protocol described in Example 1, is ligated into this BamHI site. Note that the polynucleotide is cloned without a stop codon, otherwise a fusion protein will not be produced.

If the naturally occurring signal sequence is used to produce the polypeptide of the present invention, pC4 does not need a second signal peptide. Alternatively, if the naturally  
35 occurring signal sequence is not used, the vector can be modified to include a heterologous signal sequence. (See, e.g., International Publication No. WO 96/34891.)

Human IgG Fc region:

GGGATCCGGAGCCCAAATCTTCTGACAAAACCTCACACATGCCACCGTGCCAGCAC  
 CTGAATTCGAGGGTGCACCGTCAGTCTTCTCTTCCCCCAAACCAAGGACACCT  
 5 CATGATCTCCCGGACTCCTGAGGTACATGCGTGGTGGTGGACGTAAGCCACGAAGA  
 CCCTGAGGTCAAGTTCAACTGGTACGTGGACGGCGTGGAGGTGCATAATGCCAAGAC  
 AAAGCCGCGGGAGGAGCAGTACAACAGCACGTACCGTGTGGTCAGCGTCTCACCGT  
 CCTGCACCAGGACTGGCTGAATGGCAAGGAGTACAAGTGCAAGGTCTCCAACAAAGC  
 CCTCCCAACCCCATCGAGAAAACCATCTCAAAGCCAAAGGGCAGCCCCGAGAACC  
 10 ACAGGTGTACACCTGCCCCATCCCGGGATGAGCTGACCAAGAACCAGGTGAGCCT  
 GACCTGCCTGGTCAAAGGCTTCTATCCAAGCGACATCGCCGTGGAGTGGGAGAGCAA  
 TGGGCAGCCGGAGAACAACACTACAAGACCACGCCTCCCGTGCTGGACTCCGACGGCTC  
 CTTCTCTCTACAGCAAGCTCACCGTGGACAAGAGCAGGTGGCAGCAGGGGAACGT  
 CTTCTCATGCTCCGTGATGCATGAGGCTCTGCACAACCACTACACGCAGAAGAGCCTC  
 15 TCCCTGTCTCCGGGTAAATGAGTGCGACGGCCGCGACTCTAGAGGAT (SEQ ID NO: 1)

*Example 10: Production of an Antibody from a Polypeptide*

a) Hybridoma Technology

The antibodies of the present invention can be prepared by a variety of methods. (See,  
 20 Current Protocols, Chapter 2.) As one example of such methods, cells expressing a polypeptide of  
 the present invention are administered to an animal to induce the production of sera containing  
 polyclonal antibodies. In a preferred method, a preparation of a polypeptide of the present  
 invention is prepared and purified to render it substantially free of natural contaminants. Such a  
 preparation is then introduced into an animal in order to produce polyclonal antisera of greater  
 25 specific activity.

Monoclonal antibodies specific for a polypeptide of the present invention are prepared  
 using hybridoma technology (Kohler et al., Nature 256:495 (1975); Kohler et al., Eur. J. Immunol.  
 6:511 (1976); Kohler et al., Eur. J. Immunol. 6:292 (1976); Hammerling et al., in: Monoclonal  
 Antibodies and T-Cell Hybridomas, Elsevier, N.Y., pp. 563-681 (1981)). In general, an animal  
 30 (preferably a mouse) is immunized with a polypeptide of the present invention or, more preferably,  
 with a secreted polypeptide-expressing cell. Such polypeptide-expressing cells are cultured in any  
 suitable tissue culture medium, preferably in Earle's modified Eagle's medium supplemented with  
 10% fetal bovine serum (inactivated at about 56°C), and supplemented with about 10 g/l of  
 nonessential amino acids, about 1,000 U/ml of penicillin, and about 100 µg/ml of streptomycin.

35 The splenocytes of such mice are extracted and fused with a suitable myeloma cell  
 line. Any suitable myeloma cell line may be employed in accordance with the present invention;

however, it is preferable to employ the parent myeloma cell line (SP2O), available from the ATCC. After fusion, the resulting hybridoma cells are selectively maintained in HAT medium, and then cloned by limiting dilution as described by Wands et al. (Gastroenterology 80:225-232 (1981)). The hybridoma cells obtained through such a selection are then assayed to identify clones  
5 which secrete antibodies capable of binding the polypeptide of the present invention.

Alternatively, additional antibodies capable of binding to a polypeptide of the present invention can be produced in a two-step procedure using anti-idiotypic antibodies. Such a method makes use of the fact that antibodies are themselves antigens, and therefore, it is possible to obtain an antibody that binds to a second antibody. In accordance with this method, protein specific  
10 antibodies are used to immunize an animal, preferably a mouse. The splenocytes of such an animal are then used to produce hybridoma cells, and the hybridoma cells are screened to identify clones which produce an antibody whose ability to bind to the polypeptide-specific antibody can be blocked by said polypeptide. Such antibodies comprise anti-idiotypic antibodies to the polypeptide-specific antibody and are used to immunize an animal to induce formation of further  
15 polypeptide-specific antibodies.

For *in vivo* use of antibodies in humans, an antibody is "humanized". Such antibodies can be produced using genetic constructs derived from hybridoma cells producing the monoclonal antibodies described above. Methods for producing chimeric and humanized antibodies are known in the art and are discussed herein. (See, for review, Morrison, Science 229:1202 (1985); Oi et al.,  
20 BioTechniques 4:214 (1986); Cabilly et al., U.S. Patent No. 4,816,567; Taniguchi et al., EP 171496; Morrison et al., EP 173494; Neuberger et al., WO 8601533; Robinson et al., International Publication No. WO 8702671; Boulianne et al., Nature 312:643 (1984); Neuberger et al., Nature 314:268 (1985)).

25 b) Isolation Of Antibody Fragments Directed Against a Polypeptide of the Present Invention From A Library Of scFvs

Naturally occurring V-genes isolated from human PBLs are constructed into a library of antibody fragments which contain reactivities against a polypeptide of the present invention to which the donor may or may not have been exposed (see e.g., U.S. Patent 5,885,793 incorporated  
30 herein by reference in its entirety).

*Rescue of the Library.* A library of scFvs is constructed from the RNA of human PBLs as described in International Publication No. WO 92/01047. To rescue phage displaying antibody fragments, approximately  $10^9$  *E. coli* harboring the phagemid are used to inoculate 50 ml of 2xTY containing 1% glucose and 100 µg/ml of ampicillin (2xTY-AMP-GLU) and grown to an  
35 O.D. of 0.8 with shaking. Five ml of this culture is used to inoculate 50 ml of 2xTY-AMP-GLU, 2 x  $10^8$  TU of delta gene 3 helper (M13 delta gene III, see International Publication No. WO

92/01047) are added and the culture incubated at 37°C for 45 minutes without shaking and then at 37°C for 45 minutes with shaking. The culture is centrifuged at 4000 r.p.m. for 10 min. and the pellet resuspended in 2 liters of 2xTY containing 100 µg/ml ampicillin and 50 µg/ml kanamycin and grown overnight. Phage are prepared as described in International Publication No. WO 92/01047.

5 M13 delta gene III is prepared as follows: M13 delta gene III helper phage does not encode gene III protein, hence the phage(mid) displaying antibody fragments have a greater avidity of binding to antigen. Infectious M13 delta gene III particles are made by growing the helper phage in cells harboring a pUC19 derivative supplying the wild type gene III protein during  
10 phage morphogenesis. The culture is incubated for 1 hour at 37° C without shaking and then for a further hour at 37°C with shaking. Cells are spun down (IEC-Centra 8,400 r.p.m. for 10 min), resuspended in 300 ml 2xTY broth containing 100 µg ampicillin/ml and 25 µg kanamycin/ml (2xTY-AMP-KAN) and grown overnight, shaking at 37°C. Phage particles are purified and concentrated from the culture medium by two PEG-precipitations (Sambrook et al., 1990),  
15 resuspended in 2 ml PBS and passed through a 0.45 µm filter (Minisart NML; Sartorius) to give a final concentration of approximately 10<sup>13</sup> transducing units/ml (ampicillin-resistant clones).

*Panning of the Library.* Immunotubes (Nunc) are coated overnight in PBS with 4 ml of either 100 µg/ml or 10 µg/ml of a polypeptide of the present invention. Tubes are blocked with 2% Marvel-PBS for 2 hours at 37°C and then washed 3 times in PBS. Approximately 10<sup>13</sup> TU of  
20 phage is applied to the tube and incubated for 30 minutes at room temperature tumbling on an over and under turntable and then left to stand for another 1.5 hours. Tubes are washed 10 times with PBS 0.1% Tween-20 and 10 times with PBS. Phage are eluted by adding 1 ml of 100 mM triethylamine and rotating 15 minutes on an under and over turntable after which the solution is immediately neutralized with 0.5 ml of 1.0M Tris-HCl, pH 7.4. Phage are then used to infect 10  
25 ml of mid-log E. coli TG1 by incubating eluted phage with bacteria for 30 minutes at 37°C. The E. coli are then plated on TYE plates containing 1% glucose and 100 µg/ml ampicillin. The resulting bacterial library is then rescued with delta gene 3 helper phage as described above to prepare phage for a subsequent round of selection. This process is then repeated for a total of 4 rounds of affinity purification with tube-washing increased to 20 times with PBS, 0.1% Tween-20  
30 and 20 times with PBS for rounds 3 and 4.

*Characterization of Binders.* Eluted phage from the 3rd and 4th rounds of selection are used to infect E. coli HB 2151 and soluble scFv is produced (Marks, et al., 1991) from single colonies for assay. ELISAs are performed with microtitre plates coated with either 10 µg/ml of the polypeptide of the present invention in 50 mM bicarbonate pH 9.6. Clones positive in ELISA are  
35 further characterized by PCR fingerprinting (see, e.g., International Publication No. WO 92/01047) and then by sequencing. These ELISA positive clones may also be further

characterized by techniques known in the art, such as, for example, epitope mapping, binding affinity, receptor signal transduction, ability to block or competitively inhibit antibody/antigen binding, and competitive agonistic or antagonistic activity.

5     **Example 11: Method of Determining Alterations in a Gene Corresponding to a Polynucleotide**

RNA isolated from entire families or individual patients presenting with an immune disease or disorder is isolated. cDNA is then generated from these RNA samples using protocols known in the art. (See, Sambrook.) The cDNA is then used as a template for PCR, employing primers surrounding regions of interest in SEQ ID NO:X; and/or the nucleotide sequence of the  
10     cDNA contained in ATCC Deposit No:Z. Suggested PCR conditions consist of 35 cycles at 95 degrees C for 30 seconds; 60-120 seconds at 52-58 degrees C; and 60-120 seconds at 70 degrees C, using buffer solutions described in Sidransky et al., Science 252:706 (1991).

PCR products are then sequenced using primers labeled at their 5' end with T4 polynucleotide kinase, employing SequiTherm Polymerase (Epicentre Technologies). The intron-  
15     exon boundaries of selected exons is also determined and genomic PCR products analyzed to confirm the results. PCR products harboring suspected mutations are then cloned and sequenced to validate the results of the direct sequencing.

PCR products are cloned into T-tailed vectors as described in Holton et al., Nucleic Acids Research, 19:1156 (1991) and sequenced with T7 polymerase (United States Biochemical).  
20     Affected individuals are identified by mutations not present in unaffected individuals.

Genomic rearrangements are also observed as a method of determining alterations in a gene corresponding to a polynucleotide. Genomic clones isolated according to Example 2 are nick-translated with digoxigenin deoxy-uridine 5'-triphosphate (Boehringer Mannheim), and FISH performed as described in Johnson et al., Methods Cell Biol. 35:73-99 (1991). Hybridization with  
25     the labeled probe is carried out using a vast excess of human cot-1 DNA for specific hybridization to the corresponding genomic locus.

Chromosomes are counterstained with 4,6-diamino-2-phenylidole and propidium iodide, producing a combination of C- and R-bands. Aligned images for precise mapping are obtained using a triple-band filter set (Chroma Technology, Brattleboro, VT) in combination with  
30     a cooled charge-coupled device camera (Photometrics, Tucson, AZ) and variable excitation wavelength filters. (Johnson et al., Genet. Anal. Tech. Appl., 8:75 (1991)). Image collection, analysis and chromosomal fractional length measurements are performed using the ISee Graphical Program System. (Inovision Corporation, Durham, NC.) Chromosome alterations of the genomic region hybridized by the probe are identified as insertions, deletions, and translocations. These  
35     alterations are used as a diagnostic marker for an associated disease.

**Example 12: Method of Detecting Abnormal Levels of a Polypeptide in a Biological Sample**

A polypeptide of the present invention can be detected in a biological sample, and if an increased or decreased level of the polypeptide is detected, this polypeptide is a marker for a particular phenotype. Methods of detection are numerous, and thus, it is understood that one skilled in the art can modify the following assay to fit their particular needs.

For example, antibody-sandwich ELISAs are used to detect polypeptides in a sample, preferably a biological sample. Wells of a microtiter plate are coated with specific antibodies, at a final concentration of 0.2 to 10 ug/ml. The antibodies are either monoclonal or polyclonal and are produced by the method described in Example 10. The wells are blocked so that non-specific binding of the polypeptide to the well is reduced.

The coated wells are then incubated for > 2 hours at RT with a sample containing the polypeptide. Preferably, serial dilutions of the sample should be used to validate results. The plates are then washed three times with deionized or distilled water to remove unbound polypeptide.

Next, 50 ul of specific antibody-alkaline phosphatase conjugate, at a concentration of 25-400 ng, is added and incubated for 2 hours at room temperature. The plates are again washed three times with deionized or distilled water to remove unbound conjugate.

Add 75 ul of 4-methylumbelliferyl phosphate (MUP) or p-nitrophenyl phosphate (NPP) substrate solution to each well and incubate 1 hour at room temperature. Measure the reaction by a microtiter plate reader. Prepare a standard curve, using serial dilutions of a control sample, and plot polypeptide concentration on the X-axis (log scale) and fluorescence or absorbance of the Y-axis (linear scale). Interpolate the concentration of the polypeptide in the sample using the standard curve.

**Example 13: Formulation**

The invention also provides methods of preventing, treating and/or ameliorating an immune disease or disorder by administration to a subject of an effective amount of a Therapeutic. By therapeutic is meant polynucleotides or polypeptides of the invention (including fragments and variants), agonists or antagonists thereof, and/or antibodies thereto, in combination with a pharmaceutically acceptable carrier type (e.g., a sterile carrier).

The Therapeutic will be formulated and dosed in a fashion consistent with good medical practice, taking into account the clinical condition of the individual patient (especially the side effects of treatment with the Therapeutic alone), the site of delivery, the method of administration, the scheduling of administration, and other factors known to practitioners. The "effective amount" for purposes herein is thus determined by such considerations.

As a general proposition, the total pharmaceutically effective amount of the Therapeutic administered parenterally per dose will be in the range of about 1 µg/kg/day to 10 mg/kg/day of patient body weight, although, as noted above, this will be subject to therapeutic discretion. More preferably, this dose is at least 0.01 mg/kg/day, and most preferably for humans  
5 between about 0.01 and 1 mg/kg/day for the hormone. If given continuously, the Therapeutic is typically administered at a dose rate of about 1 µg/kg/hour to about 50 µg/kg/hour, either by 1-4 injections per day or by continuous subcutaneous infusions, for example, using a mini-pump. An intravenous bag solution may also be employed. The length of treatment needed to observe changes and the interval following treatment for responses to occur appears to vary depending on  
10 the desired effect.

Therapeutics can be administered orally, rectally, parenterally, intracisternally, intravaginally, intraperitoneally, topically (as by powders, ointments, gels, drops or transdermal patch), buccally, or as an oral or nasal spray. "Pharmaceutically acceptable carrier" refers to a non-toxic solid, semisolid or liquid filler, diluent, encapsulating material or formulation auxiliary of  
15 any. The term "parenteral" as used herein refers to modes of administration which include intravenous, intramuscular, intraperitoneal, intrasternal, subcutaneous and intraarticular injection and infusion.

Therapeutics of the invention are also suitably administered by sustained-release systems. Suitable examples of sustained-release Therapeutics are administered orally, rectally,  
20 parenterally, intracisternally, intravaginally, intraperitoneally, topically (as by powders, ointments, gels, drops or transdermal patch), buccally, or as an oral or nasal spray. "Pharmaceutically acceptable carrier" refers to a non-toxic solid, semisolid or liquid filler, diluent, encapsulating material or formulation auxiliary of any type. The term "parenteral" as used herein refers to modes of administration which include intravenous, intramuscular, intraperitoneal, intrasternal,  
25 subcutaneous and intraarticular injection and infusion.

Therapeutics of the invention are also suitably administered by sustained-release systems. Suitable examples of sustained-release Therapeutics include suitable polymeric materials (such as, for example, semi-permeable polymer matrices in the form of shaped articles, e.g., films, or microcapsules), suitable hydrophobic materials (for example as an emulsion in an acceptable oil)  
30 or ion exchange resins, and sparingly soluble derivatives (such as, for example, a sparingly soluble salt).

Sustained-release matrices include polylactides (U.S. Pat. No. 3,773,919, EP 58,481), copolymers of L-glutamic acid and gamma-ethyl-L-glutamate (Sidman et al., Biopolymers 22:547-556 (1983)), poly (2-hydroxyethyl methacrylate) (Langer et al., J. Biomed. Mater. Res. 15:167-277 (1981), and Langer, Chem. Tech. 12:98-105 (1982)), ethylene vinyl acetate (Langer et al., Id.) or poly-D-(-)-3-hydroxybutyric acid (EP 133,988).  
35



In a preferred embodiment, polypeptide, polynucleotide, and antibody compositions of the invention are formulated in a biodegradable, polymeric drug delivery system, for example as described in U.S. Patent Nos. 4,938,763; 5,278,201; 5,278,202; 5,324,519; 5,340,849; and 5,487,897 and in International Publication Numbers WO01/35929, WO00/24374, and  
5 WO00/06117 which are hereby incorporated by reference in their entirety. In specific preferred embodiments the polypeptide, polynucleotide, and antibody compositions of the invention are formulated using the ATRIGEL® Biodegradable System of Atrix Laboratories, Inc. (Fort Collins, Colorado).

Examples of biodegradable polymers which can be used in the formulation of  
10 polypeptide, polynucleotide, and antibody compositions, include but are not limited to, polylactides, polyglycolides, polycaprolactones, polyanhydrides, polyamides, polyurethanes, polyesteramides, polyorthoesters, polydioxanones, polyacetals, polyketals, polycarbonates, polyorthocarbonates, polyphosphazenes, polyhydroxybutyrates, polyhydroxyvalerates, polyalkylene oxalates, polyalkylene succinates, poly(malic acid), poly(amino acids), poly(methyl  
15 vinyl ether), poly(maleic anhydride), polyvinylpyrrolidone, polyethylene glycol, polyhydroxycellulose, chitin, chitosan, and copolymers, terpolymers, or combinations or mixtures of the above materials. The preferred polymers are those that have a lower degree of crystallization and are more hydrophobic. These polymers and copolymers are more soluble in the biocompatible solvents than the highly crystalline polymers such as polyglycolide and chitin which also have a  
20 high degree of hydrogen-bonding. Preferred materials with the desired solubility parameters are the polylactides, polycaprolactones, and copolymers of these with glycolide in which there are more amorphous regions to enhance solubility. In specific preferred embodiments, the biodegradable polymers which can be used in the formulation of polypeptide, polynucleotide, and antibody compositions are poly(lactide-co-glycolides). Polymer properties such as molecular  
25 weight, hydrophobicity, and lactide/glycolide ratio may be modified to obtain the desired polypeptide, polynucleotide, or antibody release profile (See, e.g., Ravivarapu et al., Journal of Pharmaceutical Sciences 89:732-741 (2000), which is hereby incorporated by reference in its entirety).

It is also preferred that the solvent for the biodegradable polymer be non-toxic, water  
30 miscible, and otherwise biocompatible. Examples of such solvents include, but are not limited to, N-methyl-2-pyrrolidone, 2-pyrrolidone, C2 to C6 alkanols, C1 to C15 alcohols, diols, triols, and tetraols such as ethanol, glycerine propylene glycol, butanol; C3 to C15 alkyl ketones such as acetone, diethyl ketone and methyl ethyl ketone; C3 to C15 esters such as methyl acetate, ethyl acetate, ethyl lactate; alkyl ketones such as methyl ethyl ketone, C1 to C15 amides such as  
35 dimethylformamide, dimethylacetamide and caprolactam; C3 to C20 ethers such as tetrahydrofuran, or solketal; tweens, triacetin, propylene carbonate, decylmethylsulfoxide,

dimethyl sulfoxide, oleic acid, 1-dodecylazacycloheptan-2-one, Other preferred solvents are benzyl alcohol, benzyl benzoate, dipropylene glycol, tributyrin, ethyl oleate, glycerin, glycofural, isopropyl myristate, isopropyl palmitate, oleic acid, polyethylene glycol, propylene carbonate, and triethyl citrate. The most preferred solvents are N-methyl-2-pyrrolidone, 2-pyrrolidone, dimethyl sulfoxide, triacetin, and propylene carbonate because of the solvating ability and their compatibility.

Additionally, formulations comprising polypeptide, polynucleotide, and antibody compositions and a biodegradable polymer may also include release-rate modification agents and/or pore-forming agents. Examples of release-rate modification agents include, but are not limited to, fatty acids, triglycerides, other like hydrophobic compounds, organic solvents, plasticizing compounds and hydrophilic compounds. Suitable release rate modification agents include, for example, esters of mono-, di-, and tricarboxylic acids, such as 2-ethoxyethyl acetate, methyl acetate, ethyl acetate, diethyl phthalate, dimethyl phthalate, dibutyl phthalate, dimethyl adipate, dimethyl succinate, dimethyl oxalate, dimethyl citrate, triethyl citrate, acetyl tributyl citrate, acetyl triethyl citrate, glycerol triacetate, di(n-butyl) sebecate, and the like; polyhydroxy alcohols, such as propylene glycol, polyethylene glycol, glycerin, sorbitol, and the like; fatty acids; triesters of glycerol, such as triglycerides, epoxidized soybean oil, and other epoxidized vegetable oils; sterols, such as cholesterol; alcohols, such as C.sub.6 -C.sub.12 alkanols, 2-ethoxyethanol. The release rate modification agent may be used singly or in combination with other such agents. Suitable combinations of release rate modification agents include, but are not limited to, glycerin/propylene glycol, sorbitol/glycerine, ethylene oxide/propylene oxide, butylene glycol/adipic acid, and the like. Preferred release rate modification agents include, but are not limited to, dimethyl citrate, triethyl citrate, ethyl heptanoate, glycerin, and hexanediol. Suitable pore-forming agents that may be used in the polymer composition include, but are not limited to, sugars such as sucrose and dextrose, salts such as sodium chloride and sodium carbonate, polymers such as hydroxylpropylcellulose, carboxymethylcellulose, polyethylene glycol, and polyvinylpyrrolidone. Solid crystals that will provide a defined pore size, such as salt or sugar, are preferred.

In specific preferred embodiments the polypeptide, polynucleotide, and antibody compositions of the invention are formulated using the BEMA™ BioErodible Mucoadhesive System, MCA™ MucoCutaneous Absorption System, SMP™ Solvent MicroParticle System, or BCP™ BioCompatible Polymer System of Atrix Laboratories, Inc. (Fort Collins, Colorado).

Sustained-release Therapeutics also include liposomally entrapped Therapeutics of the invention (see generally, Langer, *Science* 249:1527-1533 (1990); Treat et al., in *Liposomes in the Therapy of Infectious Disease and Cancer*, Lopez-Berestein and Fidler (eds.), Liss, New York, pp. 317 -327 and 353-365 (1989)). Liposomes containing the Therapeutic are prepared by methods

known per se: DE 3,218,121; Epstein et al., Proc. Natl. Acad. Sci. (USA) 82:3688-3692 (1985); Hwang et al., Proc. Natl. Acad. Sci.(USA) 77:4030-4034 (1980); EP 52,322; EP 36,676; EP 88,046; EP 143,949; EP 142,641; Japanese Pat. Appl. 83-118008; U.S. Pat. Nos. 4,485,045 and 4,544,545; and EP 102,324. Ordinarily, the liposomes are of the small (about 200-800 Angstroms)  
5 unilamellar type in which the lipid content is greater than about 30 mol. percent cholesterol, the selected proportion being adjusted for the optimal Therapeutic.

In yet an additional embodiment, the Therapeutics of the invention are delivered by way of a pump (*see* Langer, *supra*; Sefton, CRC Crit. Ref. Biomed. Eng. 14:201 (1987); Buchwald et al., Surgery 88:507 (1980); Saudek et al., N. Engl. J. Med. 321:574 (1989)).

10 Other controlled release systems are discussed in the review by Langer (*Science* 249:1527-1533 (1990)).

For parenteral administration, in one embodiment, the Therapeutic is formulated generally by mixing it at the desired degree of purity, in a unit dosage injectable form (solution, suspension, or emulsion), with a pharmaceutically acceptable carrier, i.e., one that is non-toxic to  
15 recipients at the dosages and concentrations employed and is compatible with other ingredients of the formulation. For example, the formulation preferably does not include oxidizing agents and other compounds that are known to be deleterious to the Therapeutic.

Generally, the formulations are prepared by contacting the Therapeutic uniformly and intimately with liquid carriers or finely divided solid carriers or both. Then, if necessary, the  
20 product is shaped into the desired formulation. Preferably the carrier is a parenteral carrier, more preferably a solution that is isotonic with the blood of the recipient. Examples of such carrier vehicles include water, saline, Ringer's solution, and dextrose solution. Non-aqueous vehicles such as fixed oils and ethyl oleate are also useful herein, as well as liposomes.

The carrier suitably contains minor amounts of additives such as substances that  
25 enhance isotonicity and chemical stability. Such materials are non-toxic to recipients at the dosages and concentrations employed, and include buffers such as phosphate, citrate, succinate, acetic acid, and other organic acids or their salts; antioxidants such as ascorbic acid; low molecular weight (less than about ten residues) polypeptides, e.g., polyarginine or tripeptides; proteins, such as serum albumin, gelatin, or immunoglobulins; hydrophilic polymers such as  
30 polyvinylpyrrolidone; amino acids, such as glycine, glutamic acid, aspartic acid, or arginine; monosaccharides, disaccharides, and other carbohydrates including cellulose or its derivatives, glucose, manose, or dextrans; chelating agents such as EDTA; sugar alcohols such as mannitol or sorbitol; counterions such as sodium; and/or nonionic surfactants such as polysorbates, poloxamers, or PEG.

35 The Therapeutic is typically formulated in such vehicles at a concentration of about 0.1 mg/ml to 100 mg/ml, preferably 1-10 mg/ml, at a pH of about 3 to 8. It will be understood that

the use of certain of the foregoing excipients, carriers, or stabilizers will result in the formation of polypeptide salts.

Any pharmaceutical used for therapeutic administration can be sterile. Sterility is readily accomplished by filtration through sterile filtration membranes (e.g., 0.2 micron membranes). Therapeutics generally are placed into a container having a sterile access port, for example, an intravenous solution bag or vial having a stopper pierceable by a hypodermic injection needle.

Therapeutics ordinarily will be stored in unit or multi-dose containers, for example, sealed ampoules or vials, as an aqueous solution or as a lyophilized formulation for reconstitution. As an example of a lyophilized formulation, 10-ml vials are filled with 5 ml of sterile-filtered 1% (w/v) aqueous Therapeutic solution, and the resulting mixture is lyophilized. The infusion solution is prepared by reconstituting the lyophilized Therapeutic using bacteriostatic Water-for-Injection.

The invention also provides a pharmaceutical pack or kit comprising one or more containers filled with one or more of the ingredients of the Therapeutics of the invention. Associated with such container(s) can be a notice in the form prescribed by a governmental agency regulating the manufacture, use or sale of pharmaceuticals or biological products, which notice reflects approval by the agency of manufacture, use or sale for human administration. In addition, the Therapeutics may be employed in conjunction with other therapeutic compounds.

The Therapeutics of the invention may be administered alone or in combination with adjuvants. Adjuvants that may be administered with the Therapeutics of the invention include, but are not limited to, alum, alum plus deoxycholate (ImmunoAg), MTP-PE (Biocine Corp.), QS21 (Genentech, Inc.), BCG (e.g., THERACYS®), MPL and nonviable preparations of *Corynebacterium parvum*. In a specific embodiment, Therapeutics of the invention are administered in combination with alum. In another specific embodiment, Therapeutics of the invention are administered in combination with QS-21. Further adjuvants that may be administered with the Therapeutics of the invention include, but are not limited to, Monophosphoryl lipid immunomodulator, AdjuVax 100a, QS-21, QS-18, CRL1005, Aluminum salts, MF-59, and Virosomal adjuvant technology. Vaccines that may be administered with the Therapeutics of the invention include, but are not limited to, vaccines directed toward protection against MMR (measles, mumps, rubella), polio, varicella, tetanus/diphtheria, hepatitis A, hepatitis B, haemophilus influenzae B, whooping cough, pneumonia, influenza, Lyme's Disease, rotavirus, cholera, yellow fever, Japanese encephalitis, poliomyelitis, rabies, typhoid fever, and pertussis. Combinations may be administered either concomitantly, e.g., as an admixture, separately but simultaneously or concurrently; or sequentially. This includes presentations in which the combined agents are administered together as a therapeutic mixture, and also procedures in which

the combined agents are administered separately but simultaneously, e.g., as through separate intravenous lines into the same individual. Administration "in combination" further includes the separate administration of one of the compounds or agents given first, followed by the second.

The Therapeutics of the invention may be administered alone or in combination with  
5 other therapeutic agents. Therapeutic agents that may be administered in combination with the Therapeutics of the invention, include but not limited to, chemotherapeutic agents, antibiotics, steroidal and non-steroidal anti-inflammatories, conventional immunotherapeutic agents, and/or therapeutic treatments described below. Combinations may be administered either concomitantly, e.g., as an admixture, separately but simultaneously or concurrently; or sequentially. This includes  
10 presentations in which the combined agents are administered together as a therapeutic mixture, and also procedures in which the combined agents are administered separately but simultaneously, e.g., as through separate intravenous lines into the same individual. Administration "in combination" further includes the separate administration of one of the compounds or agents given first, followed by the second.

15 In one embodiment, the Therapeutics of the invention are administered in combination with an anticoagulant. Anticoagulants that may be administered with the compositions of the invention include, but are not limited to, heparin, low molecular weight heparin, warfarin sodium (e.g., COUMADIN®), dicumarol, 4-hydroxycoumarin, anisindione (e.g., MIRADON™), acenocoumarol (e.g., nicoumalone, SINTHROME™), indan-1,3-dione, phenprocoumon (e.g.,  
20 MARCUMAR™), ethyl biscoumacetate (e.g., TROMEXAN™), and aspirin. In a specific embodiment, compositions of the invention are administered in combination with heparin and/or warfarin. In another specific embodiment, compositions of the invention are administered in combination with warfarin. In another specific embodiment, compositions of the invention are administered in combination with warfarin and aspirin. In another specific embodiment,  
25 compositions of the invention are administered in combination with heparin. In another specific embodiment, compositions of the invention are administered in combination with heparin and aspirin.

In another embodiment, the Therapeutics of the invention are administered in combination with thrombolytic drugs. Thrombolytic drugs that may be administered with the  
30 compositions of the invention include, but are not limited to, plasminogen, lys-plasminogen, alpha2-antiplasmin, streptokinase (e.g., KABIKINASE™), antirespace (e.g., EMINASE™), tissue plasminogen activator (t-PA, altevase, ACTIVASE™), urokinase (e.g., ABBOKINASE™), sauruplase, (Prourokinase, single chain urokinase), and aminocaproic acid (e.g., AMICAR™). In a specific embodiment, compositions of the invention are administered in combination with tissue  
35 plasminogen activator and aspirin.

In another embodiment, the Therapeutics of the invention are administered in

combination with antiplatelet drugs. Antiplatelet drugs that may be administered with the compositions of the invention include, but are not limited to, aspirin, dipyridamole (e.g., PERSANTINE™), and ticlopidine (e.g., TICLID™).

In specific embodiments, the use of anti-coagulants, thrombolytic and/or antiplatelet drugs in combination with Therapeutics of the invention is contemplated for the detection, prevention, diagnosis, prognostication, treatment, and/or amelioration of thrombosis, arterial thrombosis, venous thrombosis, thromboembolism, pulmonary embolism, atherosclerosis, myocardial infarction, transient ischemic attack, unstable angina. In specific embodiments, the use of anticoagulants, thrombolytic drugs and/or antiplatelet drugs in combination with Therapeutics of the invention is contemplated for the prevention of occlusion of saphenous grafts, for reducing the risk of periprocedural thrombosis as might accompany angioplasty procedures, for reducing the risk of stroke in patients with atrial fibrillation including nonrheumatic atrial fibrillation, for reducing the risk of embolism associated with mechanical heart valves and or mitral valves disease. Other uses for the therapeutics of the invention, alone or in combination with antiplatelet, anticoagulant, and/or thrombolytic drugs, include, but are not limited to, the prevention of occlusions in extracorporeal devices (e.g., intravascular canulas, vascular access shunts in hemodialysis patients, hemodialysis machines, and cardiopulmonary bypass machines).

In certain embodiments, Therapeutics of the invention are administered in combination with antiretroviral agents, nucleoside/nucleotide reverse transcriptase inhibitors (NRTIs), non-nucleoside reverse transcriptase inhibitors (NNRTIs), and/or protease inhibitors (PIs). NRTIs that may be administered in combination with the Therapeutics of the invention, include, but are not limited to, RETROVIR™ (zidovudine/AZT), VIDEX™ (didanosine/ddI), HIVID™ (zalcitabine/ddC), ZERIT™ (stavudine/d4T), EPIVIR™ (lamivudine/3TC), and COMBIVIR™ (zidovudine/lamivudine). NNRTIs that may be administered in combination with the Therapeutics of the invention, include, but are not limited to, VIRAMUNE™ (nevirapine), RESCRIPTOR™ (delavirdine), and SUSTIVA™ (efavirenz). Protease inhibitors that may be administered in combination with the Therapeutics of the invention, include, but are not limited to, CRIVAN™ (indinavir), NORVIR™ (ritonavir), INVIRASE™ (saquinavir), and VIRACEPT™ (nelfinavir). In a specific embodiment, antiretroviral agents, nucleoside reverse transcriptase inhibitors, non-nucleoside reverse transcriptase inhibitors, and/or protease inhibitors may be used in any combination with Therapeutics of the invention to treat AIDS and/or to prevent or treat HIV infection.

Additional NRTIs include LODENOSINE™ (F-ddA; an acid-stable adenosine NRTI; Triangle/Abbott; COVIRACIL™ (emtricitabine/FTC; structurally related to lamivudine (3TC) but with 3- to 10-fold greater activity *in vitro*; Triangle/Abbott); dOTC (BCH-10652, also structurally related to lamivudine but retains activity against a substantial proportion of lamivudine-resistant

isolates; Biochem Pharma); Adefovir (refused approval for anti-HIV therapy by FDA; Gilead Sciences); PREVEON® (Adefovir Dipivoxil, the active prodrug of adefovir; its active form is PMEA-pp); TENOFOVIR™ (bis-POC PMPA, a PMPA prodrug; Gilead); DAPD/DXG (active metabolite of DAPD; Triangle/Abbott); D-D4FC (related to 3TC, with activity against AZT/3TC-resistant virus); GW420867X (Glaxo Wellcome); ZIAGEN™ (abacavir/159U89; Glaxo Wellcome Inc.); CS-87 (3'-azido-2',3'-dideoxyuridine; WO 99/66936); and S-acyl-2-thioethyl (SATE)-bearing prodrug forms of  $\beta$ -L-FD4C and  $\beta$ -L-FddC (WO 98/17281).

Additional NNRTIs include COACTINON™ (Emivirine/MKC-442, potent NNRTI of the HEPT class; Triangle/Abbott); CAPRAVIRINE™ (AG-1549/S-1153, a next generation NNRTI with activity against viruses containing the K103N mutation; Agouron); PNU-142721 (has 20- to 50-fold greater activity than its predecessor delavirdine and is active against K103N mutants; Pharmacia & Upjohn); DPC-961 and DPC-963 (second-generation derivatives of efavirenz, designed to be active against viruses with the K103N mutation; DuPont); GW-420867X (has 25-fold greater activity than HBY097 and is active against K103N mutants; Glaxo Wellcome); CALANOLIDE A (naturally occurring agent from the latex tree; active against viruses containing either or both the Y181C and K103N mutations); and Propolis (WO 99/49830).

Additional protease inhibitors include LOPINAVIR™ (ABT378/r; Abbott Laboratories); BMS-232632 (an azapeptide; Bristol-Myers Squibb); TIPRANAVIR™ (PNU-140690, a non-peptic dihydropyrrone; Pharmacia & Upjohn); PD-178390 (a nonpeptidic dihydropyrrone; Parke-Davis); BMS 232632 (an azapeptide; Bristol-Myers Squibb); L-756,423 (an indinavir analog; Merck); DMP-450 (a cyclic urea compound; Avid & DuPont); AG-1776 (a peptidomimetic with *in vitro* activity against protease inhibitor-resistant viruses; Agouron); VX-175/GW-433908 (phosphate prodrug of amprenavir; Vertex & Glaxo Wellcome); CGP61755 (Ciba); and AGENERASE™ (amprenavir; Glaxo Wellcome Inc.).

Additional antiretroviral agents include fusion inhibitors/gp41 binders. Fusion inhibitors/gp41 binders include T-20 (a peptide from residues 643-678 of the HIV gp41 transmembrane protein ectodomain which binds to gp41 in its resting state and prevents transformation to the fusogenic state; Trimeris) and T-1249 (a second-generation fusion inhibitor; Trimeris).

Additional antiretroviral agents include fusion inhibitors/chemokine receptor antagonists. Fusion inhibitors/chemokine receptor antagonists include CXCR4 antagonists such as AMD 3100 (a bicyclam), SDF-1 and its analogs, and ALX40-4C (a cationic peptide), T22 (an 18 amino acid peptide; Trimeris) and the T22 analogs T134 and T140; CCR5 antagonists such as RANTES (9-68), AOP-RANTES, NNY-RANTES, and TAK-779; and CCR5/CXCR4 antagonists such as NSC 651016 (a distamycin analog). Also included are CCR2B, CCR3, and CCR6

antagonists. Chemokine receptor agonists such as RANTES, SDF-1, MIP-1 $\alpha$ , MIP-1 $\beta$ , etc., may also inhibit fusion.

Additional antiretroviral agents include integrase inhibitors. Integrase inhibitors include dicaffeoylquinic (DFQA) acids; L-chicoric acid (a dicaffeoyltartaric (DCTA) acid); quinalizarin (QLC) and related anthraquinones; ZINTEVIR™ (AR 177, an oligonucleotide that probably acts at cell surface rather than being a true integrase inhibitor; Arondex); and naphthols such as those disclosed in WO 98/50347.

Additional antiretroviral agents include hydroxyurea-like compounds such as BCX-34 (a purine nucleoside phosphorylase inhibitor; Biocryst); ribonucleotide reductase inhibitors such as DIDOX™ (Molecules for Health); inosine monophosphate dehydrogenase (IMPDH) inhibitors such as VX-497 (Vertex); and mycopholic acids such as CellCept (mycophenolate mofetil; Roche).

Additional antiretroviral agents include inhibitors of viral integrase, inhibitors of viral genome nuclear translocation such as arylene bis(methylketone) compounds; inhibitors of HIV entry such as AOP-RANTES, NNY-RANTES, RANTES-IgG fusion protein, soluble complexes of RANTES and glycosaminoglycans (GAG), and AMD-3100; nucleocapsid zinc finger inhibitors such as dithiane compounds; targets of HIV Tat and Rev; and pharmacoenhancers such as ABT-378.

Other antiretroviral therapies and adjunct therapies include cytokines and lymphokines such as MIP-1 $\alpha$ , MIP-1 $\beta$ , SDF-1 $\alpha$ , IL-2, PROLEUKIN™ (aldesleukin/L2-7001; Chiron), IL-4, IL-10, IL-12, and IL-13; interferons such as IFN- $\alpha$ 2a; antagonists of TNFs, NF $\kappa$ B, GM-CSF, M-CSF, and IL-10; agents that modulate immune activation such as cyclosporin and prednisone; vaccines such as Remune™ (HIV Immunogen), APL 400-003 (Apollon), recombinant gp120 and fragments, bivalent (B/E) recombinant envelope glycoprotein, rgp120CM235, MN rgp120, SF-2 rgp120, gp120/soluble CD4 complex, Delta JR-FL protein, branched synthetic peptide derived from discontinuous gp120 C3/C4 domain, fusion-competent immunogens, and Gag, Pol, Nef, and Tat vaccines; gene-based therapies such as genetic suppressor elements (GSEs; WO 98/54366), and intrakines (genetically modified CC chemokines targetted to the ER to block surface expression of newly synthesized CCR5 (Yang *et al.*, *PNAS* 94:11567-72 (1997); Chen *et al.*, *Nat. Med.* 3:1110-16 (1997)); antibodies such as the anti-CXCR4 antibody 12G5, the anti-CCR5 antibodies 2D7, 5C7, PA8, PA9, PA10, PA11, PA12, and PA14, the anti-CD4 antibodies Q4120 and RPA-T4, the anti-CCR3 antibody 7B11, the anti-gp120 antibodies 17b, 48d, 447-52D, 257-D, 268-D and 50.1, anti-Tat antibodies, anti-TNF- $\alpha$  antibodies, and monoclonal antibody 33A; aryl hydrocarbon (AH) receptor agonists and antagonists such as TCDD, 3,3',4,4',5-pentachlorobiphenyl, 3,3',4,4'-tetrachlorobiphenyl, and  $\alpha$ -naphthoflavone (WO 98/30213); and antioxidants such as  $\gamma$ -L-glutamyl-L-cysteine ethyl ester ( $\gamma$ -GCE; WO 99/56764).



In a further embodiment, the Therapeutics of the invention are administered in combination with an antiviral agent. Antiviral agents that may be administered with the Therapeutics of the invention include, but are not limited to, acyclovir, ribavirin, amantadine, and remantidine.

- 5 In other embodiments, Therapeutics of the invention may be administered in combination with anti-opportunistic infection agents. Anti-opportunistic agents that may be administered in combination with the Therapeutics of the invention, include, but are not limited to, TRIMETHOPRIM-SULFAMETHOXAZOLE™, DAPSONE™, PENTAMIDINE™, ATOVAQUONE™, ISONIAZID™, RIFAMPIN™, PYRAZINAMIDE™, ETHAMBUTOL™, 10 RIFABUTIN™, CLARITHROMYCIN™, AZITHROMYCIN™, GANCICLOVIR™, FOSCARNET™, CIDOFOVIR™, FLUCONAZOLE™, ITRACONAZOLE™, KETOCONAZOLE™, ACYCLOVIR™, FAMCICOLVIR™, PYRIMETHAMINE™, LEUCOVORIN™, NEUPOGEN™ (filgrastim/G-CSF), and LEUKINE™ (sargramostim/GM-CSF). In a specific embodiment, Therapeutics of the invention are used in any combination with 15 TRIMETHOPRIM-SULFAMETHOXAZOLE™, DAPSONE™, PENTAMIDINE™, and/or ATOVAQUONE™ to prophylactically treat or prevent an opportunistic *Pneumocystis carinii* pneumonia infection. In another specific embodiment, Therapeutics of the invention are used in any combination with ISONIAZID™, RIFAMPIN™, PYRAZINAMIDE™, and/or ETHAMBUTOL™ to prophylactically treat or prevent an opportunistic *Mycobacterium avium* 20 complex infection. In another specific embodiment, Therapeutics of the invention are used in any combination with RIFABUTIN™, CLARITHROMYCIN™, and/or AZITHROMYCIN™ to prophylactically treat or prevent an opportunistic *Mycobacterium tuberculosis* infection. In another specific embodiment, Therapeutics of the invention are used in any combination with GANCICLOVIR™, FOSCARNET™, and/or CIDOFOVIR™ to prophylactically treat or prevent an 25 opportunistic cytomegalovirus infection. In another specific embodiment, Therapeutics of the invention are used in any combination with FLUCONAZOLE™, ITRACONAZOLE™, and/or KETOCONAZOLE™ to prophylactically treat or prevent an opportunistic fungal infection. In another specific embodiment, Therapeutics of the invention are used in any combination with ACYCLOVIR™ and/or FAMCICOLVIR™ to prophylactically treat or prevent an opportunistic 30 herpes simplex virus type I and/or type II infection. In another specific embodiment, Therapeutics of the invention are used in any combination with PYRIMETHAMINE™ and/or LEUCOVORIN™ to prophylactically treat or prevent an opportunistic *Toxoplasma gondii* infection. In another specific embodiment, Therapeutics of the invention are used in any combination with LEUCOVORIN™ and/or NEUPOGEN™ to prophylactically treat or prevent an opportunistic 35 bacterial infection.

In a further embodiment, the Therapeutics of the invention are administered in combination with an antibiotic agent. Antibiotic agents that may be administered with the Therapeutics of the invention include, but are not limited to, amoxicillin, beta-lactamases, aminoglycosides, beta-lactam (glycopeptide), beta-lactamases, Clindamycin, chloramphenicol, cephalosporins, ciprofloxacin, erythromycin, fluoroquinolones, macrolides, metronidazole, penicillins, quinolones, rapamycin, rifampin, streptomycin, sulfonamide, tetracyclines, trimethoprim, trimethoprim-sulfamethoxazole, and vancomycin.

In other embodiments, the Therapeutics of the invention are administered in combination with immunostimulants. Immunostimulants that may be administered in combination with the Therapeutics of the invention include, but are not limited to, levamisole (e.g., ERGAMISOL™), isoprinosine (e.g. INOSIPLEX™), interferons (e.g. interferon alpha), and interleukins (e.g., IL-2).

In other embodiments, Therapeutics of the invention are administered in combination with immunosuppressive agents. Immunosuppressive agents that may be administered in combination with the Therapeutics of the invention include, but are not limited to, steroids, cyclosporine, cyclosporine analogs, cyclophosphamide methylprednisone, prednisone, azathioprine, FK-506, 15-deoxyspergualin, and other immunosuppressive agents that act by suppressing the function of responding T cells. Other immunosuppressive agents that may be administered in combination with the Therapeutics of the invention include, but are not limited to, prednisolone, methotrexate, thalidomide, methoxsalen, rapamycin, leflunomide, mizoribine (BREDININ™), brequinar, deoxyspergualin, and azaspirane (SKF 105685), ORTHOCLONE OKT® 3 (muromonab-CD3), SANDIMMUNE™, NEORAL™, SANGDYA™ (cyclosporine), PROGRAF® (FK506, tacrolimus), CELLCEPT® (mycophenolate mofetil, of which the active metabolite is mycophenolic acid), IMURAN™ (azathioprine), glucocorticosteroids, adrenocortical steroids such as DELTASONE™ (prednisone) and HYDELTRASOL™ (prednisolone), FOLEX™ and MEXATE™ (methotrexate), OXSORALEN-ULTRA™ (methoxsalen) and RAPAMUNE™ (sirolimus). In a specific embodiment, immunosuppressants may be used to prevent rejection of organ or bone marrow transplantation.

In an additional embodiment, Therapeutics of the invention are administered alone or in combination with one or more intravenous immune globulin preparations. Intravenous immune globulin preparations that may be administered with the Therapeutics of the invention include, but not limited to, GAMMAR™, IVEEGAM™, SANDOglobulin™, GAMMAGARD S/D™, ATGAM™ (antithymocyte globulin), and GAMIMUNE™. In a specific embodiment, Therapeutics of the invention are administered in combination with intravenous immune globulin preparations in transplantation therapy (e.g., bone marrow transplant).

In certain embodiments, the Therapeutics of the invention are administered alone or in combination with an anti-inflammatory agent. Anti-inflammatory agents that may be administered with the Therapeutics of the invention include, but are not limited to, corticosteroids (e.g. betamethasone, budesonide, cortisone, dexamethasone, hydrocortisone, methylprednisolone, prednisolone, prednisone, and triamcinolone), nonsteroidal anti-inflammatory drugs (e.g. diclofenac, diflunisal, etodolac, fenoprofen, floctafenine, flurbiprofen, ibuprofen, indomethacin, ketoprofen, meclofenamate, mefenamic acid, meloxicam, nabumetone, naproxen, oxaprozin, phenylbutazone, piroxicam, sulindac, tenoxicam, tiaprofenic acid, and tolmetin.), as well as antihistamines, aminoarylcarboxylic acid derivatives, arylacetic acid derivatives, arylbutyric acid derivatives, arylcarboxylic acids, arylpropionic acid derivatives, pyrazoles, pyrazolones, salicylic acid derivatives, thiazinecarboxamides, e-acetamidocaproic acid, S-adenosylmethionine, 3-amino-4-hydroxybutyric acid, amixetrine, bendazac, benzydamine, bucolume, difenpiramide, ditazol, emorfazone, guaiazulene, nabumetone, nimesulide, orgotein, oxaceprol, paranyline, perisoxal, pifoxime, proquazone, proxazole, and tenidap.

In an additional embodiment, the compositions of the invention are administered alone or in combination with an anti-angiogenic agent. Anti-angiogenic agents that may be administered with the compositions of the invention include, but are not limited to, Angiostatin (Entremed, Rockville, MD), Troponin-1 (Boston Life Sciences, Boston, MA), anti-Invasive Factor, retinoic acid and derivatives thereof, paclitaxel (Taxol), Suramin, Tissue Inhibitor of Metalloproteinase-1, Tissue Inhibitor of Metalloproteinase-2, VEGI, Plasminogen Activator Inhibitor-1, Plasminogen Activator Inhibitor-2, and various forms of the lighter "d group" transition metals.

Lighter "d group" transition metals include, for example, vanadium, molybdenum, tungsten, titanium, niobium, and tantalum species. Such transition metal species may form transition metal complexes. Suitable complexes of the above-mentioned transition metal species include oxo transition metal complexes.

Representative examples of vanadium complexes include oxo vanadium complexes such as vanadate and vanadyl complexes. Suitable vanadate complexes include metavanadate and orthovanadate complexes such as, for example, ammonium metavanadate, sodium metavanadate, and sodium orthovanadate. Suitable vanadyl complexes include, for example, vanadyl acetylacetonate and vanadyl sulfate including vanadyl sulfate hydrates such as vanadyl sulfate mono- and trihydrates.

Representative examples of tungsten and molybdenum complexes also include oxo complexes. Suitable oxo tungsten complexes include tungstate and tungsten oxide complexes. Suitable tungstate complexes include ammonium tungstate, calcium tungstate, sodium tungstate dihydrate, and tungstic acid. Suitable tungsten oxides include tungsten (IV) oxide and tungsten (VI) oxide. Suitable oxo molybdenum complexes include molybdate, molybdenum oxide, and

molybdenyl complexes. Suitable molybdate complexes include ammonium molybdate and its hydrates, sodium molybdate and its hydrates, and potassium molybdate and its hydrates. Suitable molybdenum oxides include molybdenum (VI) oxide, molybdenum (VI) oxide, and molybdic acid. Suitable molybdenyl complexes include, for example, molybdenyl acetylacetonate. Other suitable tungsten and molybdenum complexes include hydroxo derivatives derived from, for example, glycerol, tartaric acid, and sugars.

A wide variety of other anti-angiogenic factors may also be utilized within the context of the present invention. Representative examples include, but are not limited to, platelet factor 4; protamine sulphate; sulphated chitin derivatives (prepared from queen crab shells), (Murata et al., Cancer Res. 51:22-26, (1991)); Sulphated Polysaccharide Peptidoglycan Complex (SP- PG) (the function of this compound may be enhanced by the presence of steroids such as estrogen, and tamoxifen citrate); Staurosporine; modulators of matrix metabolism, including for example, proline analogs, cishydroxyproline, d,L-3,4-dehydroproline, Thiaproline, alpha,alpha-dipyridyl, aminopropionitrile fumarate; 4-propyl-5-(4-pyridinyl)-2(3H)-oxazolone; Methotrexate; Mitoxantrone; Heparin; Interferons; 2 Macroglobulin-serum; ChIMP-3 (Pavloff et al., J. Bio. Chem. 267:17321-17326, (1992)); Chymostatin (Tomkinson et al., Biochem J. 286:475-480, (1992)); Cyclodextrin Tetradecasulfate; Eponemycin; Camptothecin; Fumagillin (Ingber et al., Nature 348:555-557, (1990)); Gold Sodium Thiomalate ("GST"; Matsubara and Ziff, J. Clin. Invest. 79:1440-1446, (1987)); anticollagenase-serum; alpha2-antiplasmin (Holmes et al., J. Biol. Chem. 262(4):1659-1664, (1987)); Bisantrene (National Cancer Institute); Lobenzarit disodium (N-(2)-carboxyphenyl-4- chloroanthronilic acid disodium or "CCA"; (Takeuchi et al., Agents Actions 36:312-316, (1992)); and metalloproteinase inhibitors such as BB94.

Additional anti-angiogenic factors that may also be utilized within the context of the present invention include Thalidomide, (Celgene, Warren, NJ); Angiostatic steroid; AGM-1470 (H. Brem and J. Folkman *J Pediatr. Surg.* 28:445-51 (1993)); an integrin alpha v beta 3 antagonist (C. Storgard et al., *J Clin. Invest.* 103:47-54 (1999)); carboxynaminolmidazole; Carboxyamidotriazole (CAI) (National Cancer Institute, Bethesda, MD); Conbretastatin A-4 (CA4P) (OXiGENE, Boston, MA); Squalamine (Magainin Pharmaceuticals, Plymouth Meeting, PA); TNP-470, (Tap Pharmaceuticals, Deerfield, IL); ZD-0101 AstraZeneca (London, UK); APRA (CT2584); Benefin, Byrostatin-1 (SC339555); CGP-41251 (PKC 412); CM101; Dextrazoxane (ICRF187); DMXAA; Endostatin; Flavopridiol; Genestein; GTE; ImmTher; Iressa (ZD1839); Octreotide (Somatostatin); Panretin; Penacillamine; Photopoint; PI-88; Prinomastat (AG-3340) Purlytin; Suradista (FCE26644); Tamoxifen (Nolvadex); Tazarotene; Tetrathiomolybdate; Xeloda (Capecitabine); and 5-Fluorouracil.

Anti-angiogenic agents that may be administered in combination with the compounds of the invention may work through a variety of mechanisms including, but not limited to, inhibiting

proteolysis of the extracellular matrix, blocking the function of endothelial cell-extracellular matrix adhesion molecules, by antagonizing the function of angiogenesis inducers such as growth factors, and inhibiting integrin receptors expressed on proliferating endothelial cells. Examples of anti-angiogenic inhibitors that interfere with extracellular matrix proteolysis and which may be administered in combination with the compositions of the invention include, but are not limited to, AG-3340 (Agouron, La Jolla, CA), BAY-12-9566 (Bayer, West Haven, CT), BMS-275291 (Bristol Myers Squibb, Princeton, NJ), CGS-27032A (Novartis, East Hanover, NJ), Marimastat (British Biotech, Oxford, UK), and Metastat (Aeterna, St-Foy, Quebec). Examples of anti-angiogenic inhibitors that act by blocking the function of endothelial cell-extracellular matrix adhesion molecules and which may be administered in combination with the compositions of the invention include, but are not limited to, EMD-121974 (Merck KgaA Darmstadt, Germany) and Vitaxin (Ixsys, La Jolla, CA/Medimmune, Gaithersburg, MD). Examples of anti-angiogenic agents that act by directly antagonizing or inhibiting angiogenesis inducers and which may be administered in combination with the compositions of the invention include, but are not limited to, Angiozyme (Ribozyme, Boulder, CO), Anti-VEGF antibody (Genentech, S. San Francisco, CA), PTK-787/ZK-225846 (Novartis, Basel, Switzerland), SU-101 (Sugen, S. San Francisco, CA), SU-5416 (Sugen/ Pharmacia Upjohn, Bridgewater, NJ), and SU-6668 (Sugen). Other anti-angiogenic agents act to indirectly inhibit angiogenesis. Examples of indirect inhibitors of angiogenesis which may be administered in combination with the compositions of the invention include, but are not limited to, IM-862 (Cytran, Kirkland, WA), Interferon-alpha, IL-12 (Roche, Nutley, NJ), and Pentosan polysulfate (Georgetown University, Washington, DC).

In particular embodiments, the use of compositions of the invention in combination with anti-angiogenic agents is contemplated for the treatment, prevention, and/or amelioration of an autoimmune disease, such as for example, an autoimmune disease described herein.

In a particular embodiment, the use of compositions of the invention in combination with anti-angiogenic agents is contemplated for the treatment, prevention, and/or amelioration of arthritis. In a more particular embodiment, the use of compositions of the invention in combination with anti-angiogenic agents is contemplated for the treatment, prevention, and/or amelioration of rheumatoid arthritis.

In another embodiment, the polynucleotides encoding a polypeptide of the present invention are administered in combination with an angiogenic protein, or polynucleotides encoding an angiogenic protein. Examples of angiogenic proteins that may be administered with the compositions of the invention include, but are not limited to, acidic and basic fibroblast growth factors, VEGF-1, VEGF-2, VEGF-3, epidermal growth factor alpha and beta, platelet-derived endothelial cell growth factor, platelet-derived growth factor, tumor necrosis factor alpha,

hepatocyte growth factor, insulin-like growth factor, colony stimulating factor, macrophage colony stimulating factor, granulocyte/macrophage colony stimulating factor, and nitric oxide synthase.

In additional embodiments, compositions of the invention are administered in combination with a chemotherapeutic agent. Chemotherapeutic agents that may be administered with the Therapeutics of the invention include, but are not limited to alkylating agents such as nitrogen mustards (for example, Mechlorethamine, cyclophosphamide, Cyclophosphamide Ifosfamide, Melphalan (L-sarcosine), and Chlorambucil), ethylenimines and methylmelamines (for example, Hexamethylmelamine and Thiotepa), alkyl sulfonates (for example, Busulfan), nitrosoureas (for example, Carmustine (BCNU), Lomustine (CCNU), Semustine (methyl-CCNU), and Streptozocin (streptozotocin)), triazines (for example, Dacarbazine (DTIC; dimethyltriazenoimidazolecarboxamide)), folic acid analogs (for example, Methotrexate (amethopterin)), pyrimidine analogs (for example, Fluorouracil (5-fluorouracil; 5-FU), Floxuridine (fluorodeoxyuridine; FudR), and Cytarabine (cytosine arabinoside)), purine analogs and related inhibitors (for example, Mercaptopurine (6-mercaptopurine; 6-MP), Thioguanine (6-thioguanine; TG), and Pentostatin (2'-deoxycoformycin)), vinca alkaloids (for example, Vinblastine (VLB, vinblastine sulfate)) and Vincristine (vincristine sulfate)), epipodophyllotoxins (for example, Etoposide and Teniposide), antibiotics (for example, Dactinomycin (actinomycin D), Daunorubicin (daunomycin; rubidomycin), Doxorubicin, Bleomycin, Plicamycin (mithramycin), and Mitomycin (mitomycin C), enzymes (for example, L-Asparaginase), biological response modifiers (for example, Interferon-alpha and interferon-alpha-2b), platinum coordination compounds (for example, Cisplatin (cis-DDP) and Carboplatin), anthracenedione (Mitoxantrone), substituted ureas (for example, Hydroxyurea), methylhydrazine derivatives (for example, Procarbazine (N-methylhydrazine; MIH), adrenocorticosteroids (for example, Prednisone), progestins (for example, Hydroxyprogesterone caproate, Medroxyprogesterone, Medroxyprogesterone acetate, and Megestrol acetate), estrogens (for example, Diethylstilbestrol (DES), Diethylstilbestrol diphosphate, Estradiol, and Ethinyl estradiol), antiestrogens (for example, Tamoxifen), androgens (Testosterone propionate, and Fluoxymesterone), antiandrogens (for example, Flutamide), gonadotropin-releasing hormone analogs (for example, Leuprolide), other hormones and hormone analogs (for example, methyltestosterone, estramustine, estramustine phosphate sodium, chlorotrianisene, and testolactone), and others (for example, dicarbazine, glutamic acid, and mitotane).

In one embodiment, the compositions of the invention are administered in combination with one or more of the following drugs: infliximab (also known as Remicade™ Centocor, Inc.), Trocade (Roche, RO-32-3555), Leflunomide (also known as Arava™ from Hoechst Marion Roussel), Kineret™ (an IL-1 Receptor antagonist also known as Anakinra from Amgen, Inc.)

In a specific embodiment, compositions of the invention are administered in combination with CHOP (cyclophosphamide, doxorubicin, vincristine, and prednisone) or combination of one or more of the components of CHOP. In one embodiment, the compositions of the invention are administered in combination with anti-CD20 antibodies, human monoclonal anti-CD20 antibodies. In another embodiment, the compositions of the invention are administered in combination with anti-CD20 antibodies and CHOP, or anti-CD20 antibodies and any combination of one or more of the components of CHOP, particularly cyclophosphamide and/or prednisone. In a specific embodiment, compositions of the invention are administered in combination with Rituximab. In a further embodiment, compositions of the invention are administered with Rituximab and CHOP, or Rituximab and any combination of one or more of the components of CHOP, particularly cyclophosphamide and/or prednisone. In a specific embodiment, compositions of the invention are administered in combination with tositumomab. In a further embodiment, compositions of the invention are administered with tositumomab and CHOP, or tositumomab and any combination of one or more of the components of CHOP, particularly cyclophosphamide and/or prednisone. The anti-CD20 antibodies may optionally be associated with radioisotopes, toxins or cytotoxic prodrugs.

In another specific embodiment, the compositions of the invention are administered in combination Zevalin™. In a further embodiment, compositions of the invention are administered with Zevalin™ and CHOP, or Zevalin™ and any combination of one or more of the components of CHOP, particularly cyclophosphamide and/or prednisone. Zevalin™ may be associated with one or more radisotopes. Particularly preferred isotopes are <sup>90</sup>Y and <sup>111</sup>In.

In an additional embodiment, the Therapeutics of the invention are administered in combination with cytokines. Cytokines that may be administered with the Therapeutics of the invention include, but are not limited to, IL2, IL3, IL4, IL5, IL6, IL7, IL10, IL12, IL13, IL15, anti-CD40, CD40L, IFN-gamma and TNF-alpha. In another embodiment, Therapeutics of the invention may be administered with any interleukin, including, but not limited to, IL-1alpha, IL-1beta, IL-2, IL-3, IL-4, IL-5, IL-6, IL-7, IL-8, IL-9, IL-10, IL-11, IL-12, IL-13, IL-14, IL-15, IL-16, IL-17, IL-18, IL-19, IL-20, and IL-21.

In one embodiment, the Therapeutics of the invention are administered in combination with members of the TNF family. TNF, TNF-related or TNF-like molecules that may be administered with the Therapeutics of the invention include, but are not limited to, soluble forms of TNF-alpha, lymphotoxin-alpha (LT-alpha, also known as TNF-beta), LT-beta (found in complex heterotrimer LT-alpha2-beta), OPGL, FasL, CD27L, CD30L, CD40L, 4-1BBL, DcR3, OX40L, TNF-gamma (International Publication No. WO 96/14328), AIM-I (International Publication No. WO 97/33899), endokine-alpha (International Publication No. WO 98/07880), OPG, and neutrokine-alpha (International Publication No. WO 98/18921, OX40, and nerve growth

factor (NGF), and soluble forms of Fas, CD30, CD27, CD40 and 4-1BB, TR2 (International Publication No. WO 96/34095), DR3 (International Publication No. WO 97/33904), DR4 (International Publication No. WO 98/32856), TR5 (International Publication No. WO 98/30693), TRANK, TR9 (International Publication No. WO 98/56892), TR10 (International Publication No. WO 98/54202), 312C2 (International Publication No. WO 98/06842), and TR12, and soluble forms CD154, CD70, and CD153.

In an additional embodiment, the Therapeutics of the invention are administered in combination with angiogenic proteins. Angiogenic proteins that may be administered with the Therapeutics of the invention include, but are not limited to, Glioma Derived Growth Factor (GDGF), as disclosed in European Patent Number EP-399816; Platelet Derived Growth Factor-A (PDGF-A), as disclosed in European Patent Number EP-682110; Platelet Derived Growth Factor-B (PDGF-B), as disclosed in European Patent Number EP-282317; Placental Growth Factor (PIGF), as disclosed in International Publication Number WO 92/06194; Placental Growth Factor-2 (PIGF-2), as disclosed in Hauser et al., Growth Factors, 4:259-268 (1993); Vascular Endothelial Growth Factor (VEGF), as disclosed in International Publication Number WO 90/13649; Vascular Endothelial Growth Factor-A (VEGF-A), as disclosed in European Patent Number EP-506477; Vascular Endothelial Growth Factor-2 (VEGF-2), as disclosed in International Publication Number WO 96/39515; Vascular Endothelial Growth Factor B (VEGF-3); Vascular Endothelial Growth Factor B-186 (VEGF-B186), as disclosed in International Publication Number WO 96/26736; Vascular Endothelial Growth Factor-D (VEGF-D), as disclosed in International Publication Number WO 98/02543; Vascular Endothelial Growth Factor-D (VEGF-D), as disclosed in International Publication Number WO 98/07832; and Vascular Endothelial Growth Factor-E (VEGF-E), as disclosed in German Patent Number DE19639601. The above mentioned references are herein incorporated by reference in their entireties.

In an additional embodiment, the Therapeutics of the invention are administered in combination with Fibroblast Growth Factors. Fibroblast Growth Factors that may be administered with the Therapeutics of the invention include, but are not limited to, FGF-1, FGF-2, FGF-3, FGF-4, FGF-5, FGF-6, FGF-7, FGF-8, FGF-9, FGF-10, FGF-11, FGF-12, FGF-13, FGF-14, and FGF-15.

In an additional embodiment, the Therapeutics of the invention are administered in combination with hematopoietic growth factors. Hematopoietic growth factors that may be administered with the Therapeutics of the invention include, but are not limited to, granulocyte macrophage colony stimulating factor (GM-CSF) (sargramostim, LEUKINE™, PROKINE™), granulocyte colony stimulating factor (G-CSF) (filgrastim, NEUPOGEN™), macrophage colony stimulating factor (M-CSF, CSF-1) erythropoietin (epoetin alfa, EPOGEN™, PROCRIT™), stem cell factor (SCF, c-kit ligand, steel factor), megakaryocyte colony stimulating factor, PIXY321 (a



GMCSF/IL-3 fusion protein), interleukins, especially any one or more of IL-1 through IL-12, interferon-gamma, or thrombopoietin.

In certain embodiments, Therapeutics of the present invention are administered in combination with adrenergic blockers, such as, for example, acebutolol, atenolol, betaxolol, 5 bisoprolol, carteolol, labetalol, metoprolol, nadolol, oxprenolol, penbutolol, pindolol, propranolol, sotalol, and timolol.

In another embodiment, the Therapeutics of the invention are administered in combination with an antiarrhythmic drug (e.g., adenosine, amiodarone, bretylium, digitalis, digoxin, digitoxin, diltiazem, disopyramide, esmolol, flecainide, lidocaine, mexiletine, moricizine, 10 phenytoin, procainamide, N-acetyl procainamide, propafenone, propranolol, quinidine, sotalol, tocainide, and verapamil).

In another embodiment, the Therapeutics of the invention are administered in combination with diuretic agents, such as carbonic anhydrase-inhibiting agents (e.g., acetazolamide, dichlorphenamide, and methazolamide), osmotic diuretics (e.g., glycerin, 15 isosorbide, mannitol, and urea), diuretics that inhibit  $\text{Na}^+\text{-K}^+\text{-2Cl}^-$  symport (e.g., furosemide, bumetanide, azosemide, piretanide, triparamide, ethacrynic acid, muzolimine, and torsemide), thiazide and thiazide-like diuretics (e.g., bendroflumethiazide, benzthiazide, chlorothiazide, hydrochlorothiazide, hydroflumethiazide, methyclothiazide, polythiazide, trichormethiazide, chlorthalidone, indapamide, metolazone, and quinethazone), potassium sparing diuretics (e.g., 20 amiloride and triamterene), and mineralcorticoid receptor antagonists (e.g., spironolactone, canrenone, and potassium canrenoate).

In one embodiment, the Therapeutics of the invention are administered in combination with treatments for endocrine and/or hormone imbalance disorders. Treatments for endocrine and/or hormone imbalance disorders include, but are not limited to,  $^{127}\text{I}$ , radioactive isotopes of 25 iodine such as  $^{131}\text{I}$  and  $^{123}\text{I}$ ; recombinant growth hormone, such as HUMATROPE™ (recombinant somatropin); growth hormone analogs such as PROTROPIN™ (somatrem); dopamine agonists such as PARLODEL™ (bromocriptine); somatostatin analogs such as SANDOSTATIN™ (octreotide); gonadotropin preparations such as PREGNYL™, A.P.L.™ and PROFASI™ (chorionic gonadotropin (CG)), PERGONAL™ (menotropins), and METRODIN™ (urofollitropin (uFSH)); 30 synthetic human gonadotropin releasing hormone preparations such as FACTREL™ and LUTREPULSE™ (gonadorelin hydrochloride); synthetic gonadotropin agonists such as LUPRON™ (leuprolide acetate), SUPPRELIN™ (histrelin acetate), SYNAREL™ (nafarelin acetate), and ZOLADEX™ (goserelin acetate); synthetic preparations of thyrotropin-releasing hormone such as RELEFACT TRH™ and THYPINONE™ (protirelin); recombinant human TSH 35 such as THYROGEN™; synthetic preparations of the sodium salts of the natural isomers of thyroid hormones such as L-T<sub>4</sub>™, SYNTHROID™ and LEVOTHROID™ (levothyroxine sodium),

L-T<sub>3</sub><sup>TM</sup>, CYTOMEL<sup>TM</sup> and TRIOSTAT<sup>TM</sup> (liothyroine sodium), and THYROLAR<sup>TM</sup> (liotrix); antithyroid compounds such as 6-*n*-propylthiouracil (propylthiouracil), 1-methyl-2-mercaptoimidazole and TAPAZOLE<sup>TM</sup> (methimazole), NEO-MERCAZOLE<sup>TM</sup> (carbimazole); beta-adrenergic receptor antagonists, such as propranolol and esmolol; Ca<sup>2+</sup> channel blockers; 5 dexamethasone and iodinated radiological contrast agents such as TELEPAQUE<sup>TM</sup> (iopanoic acid) and ORAGRAFIN<sup>TM</sup> (sodium ipodate).

Additional treatments for endocrine and/or hormone imbalance disorders include, but are not limited to, estrogens or conjugated estrogens such as ESTRACE<sup>TM</sup> (estradiol), ESTINYL<sup>TM</sup> (ethinyl estradiol), PREMARIN<sup>TM</sup>, ESTRATAB<sup>TM</sup>, ORTHO-EST<sup>TM</sup>, OGEN<sup>TM</sup> and estropipate 10 (estrone), ESTROVIS<sup>TM</sup> (quinestrol), ESTRADERM<sup>TM</sup> (estradiol), DELESTROGEN<sup>TM</sup> and VALERGEN<sup>TM</sup> (estradiol valerate), DEPO-ESTRADIOL CYPIONATE<sup>TM</sup> and ESTROJECT LA<sup>TM</sup> (estradiol cypionate); antiestrogens such as NOLVADEX<sup>TM</sup> (tamoxifen), SEROPHENE<sup>TM</sup> and CLOMID<sup>TM</sup> (clomiphene); progestins such as DURALUTIN<sup>TM</sup> (hydroxyprogesterone caproate), MPA<sup>TM</sup> and DEPO-PROVERA<sup>TM</sup> (medroxyprogesterone acetate), PROVERA<sup>TM</sup> and CYCRIN<sup>TM</sup> 15 (MPA), MEGACE<sup>TM</sup> (megestrol acetate), NORLUTIN<sup>TM</sup> (norethindrone), and NORLUTATE<sup>TM</sup> and AYGESTIN<sup>TM</sup> (norethindrone acetate); progesterone implants such as NORPLANT SYSTEM<sup>TM</sup> (subdermal implants of norgestrel); antiprogestins such as RU 486<sup>TM</sup> (mifepristone); hormonal contraceptives such as ENOVID<sup>TM</sup> (norethynodrel plus mestranol), PROGESTASERT<sup>TM</sup> (intrauterine device that releases progesterone), LOESTRIN<sup>TM</sup>, BREVICON<sup>TM</sup>, MODICON<sup>TM</sup>, 20 GENORA<sup>TM</sup>, NELONA<sup>TM</sup>, NORINYL<sup>TM</sup>, OVACON-35<sup>TM</sup> and OVACON-50<sup>TM</sup> (ethinyl estradiol/norethindrone), LEVLEN<sup>TM</sup>, NORDETTE<sup>TM</sup>, TRI-LEVLEN<sup>TM</sup> and TRIPHASIL-21<sup>TM</sup> (ethinyl estradiol/levonorgestrel) LO/OVRAL<sup>TM</sup> and OVRAL<sup>TM</sup> (ethinyl estradiol/norgestrel), DEMULEN<sup>TM</sup> (ethinyl estradiol/ethynodiol diacetate), NORINYL<sup>TM</sup>, ORTHO-NOVUM<sup>TM</sup>, NORETHIN<sup>TM</sup>, GENORA<sup>TM</sup>, and NELOVA<sup>TM</sup> (norethindrone/mestranol), DESOGEN<sup>TM</sup> and 25 ORTHO-CEPT<sup>TM</sup> (ethinyl estradiol/desogestrel), ORTHO-CYCLEN<sup>TM</sup> and ORTHO-TRICYCLEN<sup>TM</sup> (ethinyl estradiol/norgestimate), MICRONOR<sup>TM</sup> and NOR-QD<sup>TM</sup> (norethindrone), and OVRETTE<sup>TM</sup> (norgestrel).

Additional treatments for endocrine and/or hormone imbalance disorders include, but are not limited to, testosterone esters such as methenolone acetate and testosterone undecanoate; 30 parenteral and oral androgens such as TESTOJECT-50<sup>TM</sup> (testosterone), TESTEX<sup>TM</sup> (testosterone propionate), DELATESTRYL<sup>TM</sup> (testosterone enanthate), DEPO-TESTOSTERONE<sup>TM</sup> (testosterone cypionate), DANOCRINE<sup>TM</sup> (danazol), HALOTESTIN<sup>TM</sup> (fluoxymesterone), ORETON METHYL<sup>TM</sup>, TESTRED<sup>TM</sup> and VIRILON<sup>TM</sup> (methyltestosterone), and OXANDRIN<sup>TM</sup> (oxandrolone); testosterone transdermal systems such as TESTODERM<sup>TM</sup>; androgen receptor 35 antagonist and 5-alpha-reductase inhibitors such as ANDROCUR<sup>TM</sup> (cyproterone acetate),

- EULEXIN™ (flutamide), and PROSCAR™ (finasteride); adrenocorticotrophic hormone preparations such as CORTROSYN™ (cosyntropin); adrenocortical steroids and their synthetic analogs such as ACLOVATE™ (alclometasone dipropionate), CYCLOCORT™ (amcinonide), BECLOVENT™ and VANCERIL™ (beclomethasone dipropionate), CELESTONE™
- 5 (betamethasone), BENISONE™ and UTICORT™ (betamethasone benzoate), DIPROSONE™ (betamethasone dipropionate), CELESTONE PHOSPHATE™ (betamethasone sodium phosphate), CELESTONE SOLUSPAN™ (betamethasone sodium phosphate and acetate), BETA-VAL™ and VALISONE™ (betamethasone valerate), TEMOVATE™ (clobetasol propionate), CLODERM™ (clocortolone pivalate), CORTEF™ and HYDROCORTONE™ (cortisol (hydrocortisone)),
- 10 HYDROCORTONE ACETATE™ (cortisol (hydrocortisone) acetate), LOCOID™ (cortisol (hydrocortisone) butyrate), HYDROCORTONE PHOSPHATE™ (cortisol (hydrocortisone) sodium phosphate), A-HYDROCORT™ and SOLU CORTEF™ (cortisol (hydrocortisone) sodium succinate), WESTCORT™ (cortisol (hydrocortisone) valerate), CORTISONE ACETATE™ (cortisone acetate), DESOWENT™ and TRIDESILON™ (desonide), TOPICORT™
- 15 (desoximetasone), DECADRON™ (dexamethasone), DECADRON LA™ (dexamethasone acetate), DECADRON PHOSPHATE™ and HEXADROL PHOSPHATE™ (dexamethasone sodium phosphate), FLORONE™ and MAXIFLOR™ (diflorasone diacetate), FLORINEF ACETATE™ (fludrocortisone acetate), AEROBID™ and NASALIDE™ (flunisolide), FLUONID™ and SYNALAR™ (fluocinolone acetonide), LIDEX™ (fluocinonide), FLUOR-OP™
- 20 and FML™ (fluorometholone), CORDRAN™ (flurandrenolide), HALOG™ (halcinonide), HMS LIZUIFILM™ (medrysone), MEDROL™ (methylprednisolone), DEPO-MEDROL™ and MEDROL ACETATE™ (methylprednisone acetate), A-METHAPRED™ and SOLUMEDROL™ (methylprednisolone sodium succinate), ELOCON™ (mometasone furoate), HALDRONE™ (paramethasone acetate), DELTA-CORTEF™ (prednisolone), ECONOPRED™ (prednisolone acetate), HYDELTRASOL™ (prednisolone sodium phosphate), HYDELTRA-T.B.A™
- 25 (prednisolone tebutate), DELTASONE™ (prednisone), ARISTOCORT™ and KENACORT™ (triamcinolone), KENALOG™ (triamcinolone acetonide), ARISTOCORT™ and KENACORT DIACETATE™ (triamcinolone diacetate), and ARISTOSPAN™ (triamcinolone hexacetonide); inhibitors of biosynthesis and action of adrenocortical steroids such as CYTADREN™
- 30 (aminoglutethimide), NIZORAL™ (ketoconazole), MODRASTANE™ (trilostane), and METOPIRONE™ (metyrapone); bovine, porcine or human insulin or mixtures thereof; insulin analogs; recombinant human insulin such as HUMULIN™ and NOVOLIN™; oral hypoglycemic agents such as ORAMIDE™ and ORINASE™ (tolbutamide), DIABINESE™ (chlorpropamide), TOLAMIDE™ and TOLINASE™ (tolazamide), DYMELOR™ (acetoexamide), glibenclamide,

MICRONASE™, DIBETA™ and GLYNASE™ (glyburide), GLUCOTROL™ (glipizide), and DIAMICRON™ (gliclazide), GLUCOPHAGE™ (metformin), ciglitazone, pioglitazone, and alpha-glucosidase inhibitors; bovine or porcine glucagon; somatostatins such as SANDOSTATIN™ (octreotide); and diazoxides such as PROGLYCEM™ (diazoxide).

- 5 In one embodiment, the Therapeutics of the invention are administered in combination with treatments for uterine motility disorders. Treatments for uterine motility disorders include, but are not limited to, estrogen drugs such as conjugated estrogens (e.g., PREMARIN® and ESTRATAB®), estradiols (e.g., CLIMARA® and ALORA®), estropipate, and chlorotrianisene; progestin drugs (e.g., AMEN® (medroxyprogesterone), MICRONOR® (norethidrone acetate),  
10 PROMETRIUM® progesterone, and megestrol acetate); and estrogen/progesterone combination therapies such as, for example, conjugated estrogens/medroxyprogesterone (e.g., PREMPRO™ and PREMPHASE®) and norethindrone acetate/ethinyl estradiol (e.g., FEMHRT™).

- In an additional embodiment, the Therapeutics of the invention are administered in combination with drugs effective in treating iron deficiency and hypochromic anemias, including  
15 but not limited to, ferrous sulfate (iron sulfate, FEOSOL™), ferrous fumarate (e.g., FEOSTAT™), ferrous gluconate (e.g., FERGON™), polysaccharide-iron complex (e.g., NIFEREX™), iron dextran injection (e.g., INFED™), cupric sulfate, pyroxidine, riboflavin, Vitamin B<sub>12</sub>, cyanocobalamin injection (e.g., REDISOL™, RUBRAMIN PCT™), hydroxocobalamin, folic acid (e.g., FOLVITE™), leucovorin (folinic acid, 5-CHOH4PteGlu, citrovorum factor) or  
20 WELLCOVORIN (Calcium salt of leucovorin), transferrin or ferritin.

- In other embodiments, the Therapeutics of the invention are administered in combination with agents used to treat neurological disorders. Neurological agents that may be administered with the Therapeutics of the invention include, but are not limited to, antiepileptic  
25 agents (e.g., carbamazepine, clonazepam, ethosuximide, phenobarbital, phenytoin, primidone, valproic acid, divalproex sodium, felbamate, gabapentin, lamotrigine, levetiracetam, oxcarbazepine, tiagabine, topiramate, zonisamide, diazepam, lorazepam, and clonazepam), antiparkinsonian agents (e.g., levodopa/carbidopa, selegiline, amantidine, bromocriptine, pergolide, ropinirole, pramipexole, benzotropine; biperiden; ethopropazine; procyclidine;  
30 trihexyphenidyl, tolcapone), and ALS therapeutics (e.g. riluzole).

- In another embodiment, Therapeutics of the invention are administered in combination with vasodilating agents and/or calcium channel blocking agents. Vasodilating agents that may be administered with the Therapeutics of the invention include, but are not limited to, Angiotensin  
35 Converting Enzyme (ACE) inhibitors (e.g., papaverine, isoxsuprine, benazepril, captopril, cilazapril, enalapril, enalaprilat, fosinopril, lisinopril, moexipril, perindopril, quinapril, ramipril,

spirapril, trandolapril, and nylidrin), and nitrates (e.g., isosorbide dinitrate, isosorbide mononitrate, and nitroglycerin). Examples of calcium channel blocking agents that may be administered in combination with the Therapeutics of the invention include, but are not limited to amlodipine, bepridil, diltiazem, felodipine, flunarizine, isradipine, nicardipine, nifedipine, nimodipine, and verapamil.

In certain embodiments, the Therapeutics of the invention are administered in combination with treatments for gastrointestinal disorders. Treatments for gastrointestinal disorders that may be administered with the Therapeutic of the invention include, but are not limited to, H<sub>2</sub> histamine receptor antagonists (e.g., TAGAMET™ (cimetidine), ZANTAC™ (ranitidine), PEPCID™ (famotidine), and AXID™ (nizatidine)); inhibitors of H<sup>+</sup>, K<sup>+</sup> ATPase (e.g., PREVACID™ (lansoprazole) and PRILOSEC™ (omeprazole)); Bismuth compounds (e.g., PEPTO-BISMOL™ (bismuth subsalicylate) and DE-NOL™ (bismuth subcitrate)); various antacids; sucralfate; prostaglandin analogs (e.g. CYTOTEC™ (misoprostol)); muscarinic cholinergic antagonists; laxatives (e.g., surfactant laxatives, stimulant laxatives, saline and osmotic laxatives); antidiarrheal agents (e.g., LOMOTIL™ (diphenoxylate), MOTOFEN™ (diphenoxin), and IMODIUM™ (loperamide hydrochloride)), synthetic analogs of somatostatin such as SANDOSTATIN™ (octreotide), antiemetic agents (e.g., ZOFRAN™ (ondansetron), KYTRIL™ (granisetron hydrochloride), tropisetron, dolasetron, metoclopramide, chlorpromazine, perphenazine, prochlorperazine, promethazine, thiethylperazine, triflupromazine, domperidone, haloperidol, droperidol, trimethobenzamide, dexamethasone, methylprednisolone, dronabinol, and nabilone); D<sub>2</sub> antagonists (e.g., metoclopramide, trimethobenzamide and chlorpromazine); bile salts; chenodeoxycholic acid; ursodeoxycholic acid; and pancreatic enzyme preparations such as pancreatin and pancrelipase.

In additional embodiments, the Therapeutics of the invention are administered in combination with other therapeutic or prophylactic regimens, such as, for example, radiation therapy.

#### ***Example 14: Method of Treating Decreased Levels of the Polypeptide***

The present invention relates to a method for treating an individual in need of an increased level of a polypeptide of the invention in the body comprising administering to such an individual a composition comprising a therapeutically effective amount of polypeptides (including agonists thereto), and/or antibodies of the invention. Moreover, it will be appreciated that conditions caused by a decrease in the standard or normal expression level of a polypeptide of the present invention in an individual may be treated by administering agonists of said polypeptide. Thus, the invention also provides a method of treatment of an individual in need of an increased level of the polypeptide comprising administering to such an individual a Therapeutic comprising

an amount of the agonist (including polypeptides and antibodies of the present invention) to increase the activity level of the polypeptide in such an individual.

For example, a patient with decreased levels of a polypeptide receives a daily dose 0.1-100 ug/kg of the agonist for six consecutive days. The exact details of the dosing scheme, based on administration and formulation, are provided in Example 13.

***Example 15: Method of Treating Increased Levels of the Polypeptide***

The present invention also relates to a method of treating an individual in need of a decreased level of a polypeptide of the invention in the body comprising administering to such an individual a composition comprising a therapeutically effective amount of an antagonist of the invention (including polypeptides and antibodies of the invention).

In one example, antisense technology is used to inhibit production of a polypeptide of the present invention. This technology is one example of a method of decreasing levels of a polypeptide, due to a variety of etiologies, such as cancer.

For example, a patient diagnosed with abnormally increased levels of a polypeptide is administered intravenously antisense polynucleotides at 0.5, 1.0, 1.5, 2.0 and 3.0 mg/kg day for 21 days. This treatment is repeated after a 7-day rest period if the treatment was well tolerated. The antisense polynucleotides of the present invention can be formulated using techniques and formulations described herein (e.g. see Example 13), or otherwise known in the art.

***Example 16: Method of Treatment Using Gene Therapy-Ex Vivo***

One method of gene therapy transplants fibroblasts, which are capable of expressing a polypeptide, onto a patient. Generally, fibroblasts are obtained from a subject by skin biopsy. The resulting tissue is placed in tissue-culture medium and separated into small pieces. Small chunks of the tissue are placed on a wet surface of a tissue culture flask, approximately ten pieces are placed in each flask. The flask is turned upside down, closed tight and left at room temperature over night. After 24 hours at room temperature, the flask is inverted and the chunks of tissue remain fixed to the bottom of the flask and fresh media (e.g., Ham's F12 media, with 10% FBS, penicillin and streptomycin) is added. The flasks are then incubated at 37 degree C for approximately one week.

At this time, fresh media is added and subsequently changed every several days. After an additional two weeks in culture, a monolayer of fibroblasts emerge. The monolayer is trypsinized and scaled into larger flasks.

pMV-7 (Kirschmeier, P.T. et al., DNA, 7:219-25 (1988)), flanked by the long terminal repeats of the Moloney murine sarcoma virus, is digested with EcoRI and HindIII and

subsequently treated with calf intestinal phosphatase. The linear vector is fractionated on agarose gel and purified, using glass beads.

The cDNA encoding a polypeptide of the present invention can be amplified using PCR primers which correspond to the 5' and 3' end sequences respectively as set forth in Example 1 using primers and having appropriate restriction sites and initiation/stop codons, if necessary. Preferably, the 5' primer contains an EcoRI site and the 3' primer includes a HindIII site. Equal quantities of the Moloney murine sarcoma virus linear backbone and the amplified EcoRI and HindIII fragment are added together, in the presence of T4 DNA ligase. The resulting mixture is maintained under conditions appropriate for ligation of the two fragments. The ligation mixture is then used to transform bacteria HB101, which are then plated onto agar containing kanamycin for the purpose of confirming that the vector has the gene of interest properly inserted.

The amphotropic pA317 or GP+am12 packaging cells are grown in tissue culture to confluent density in Dulbecco's Modified Eagles Medium (DMEM) with 10% calf serum (CS), penicillin and streptomycin. The MSV vector containing the gene is then added to the media and the packaging cells transduced with the vector. The packaging cells now produce infectious viral particles containing the gene (the packaging cells are now referred to as producer cells).

Fresh media is added to the transduced producer cells, and subsequently, the media is harvested from a 10 cm plate of confluent producer cells. The spent media, containing the infectious viral particles, is filtered through a millipore filter to remove detached producer cells and this media is then used to infect fibroblast cells. Media is removed from a sub-confluent plate of fibroblasts and quickly replaced with the media from the producer cells. This media is removed and replaced with fresh media. If the titer of virus is high, then virtually all fibroblasts will be infected and no selection is required. If the titer is very low, then it is necessary to use a retroviral vector that has a selectable marker, such as neo or his. Once the fibroblasts have been efficiently infected, the fibroblasts are analyzed to determine whether protein is produced.

The engineered fibroblasts are then transplanted onto the host, either alone or after having been grown to confluence on cytodex 3 microcarrier beads.

#### ***Example 17: Gene Therapy Using Endogenous Genes Corresponding To Polynucleotides of the Invention***

Another method of gene therapy according to the present invention involves operably associating the endogenous polynucleotide sequence of the invention with a promoter via homologous recombination as described, for example, in U.S. Patent NO: 5,641,670, issued June 24, 1997; International Publication NO: WO 96/29411, published September 26, 1996; International Publication NO: WO 94/12650, published August 4, 1994; Koller et al., *Proc. Natl. Acad. Sci. USA*, 86:8932-8935 (1989); and Zijlstra et al., *Nature*, 342:435-438 (1989). This

method involves the activation of a gene which is present in the target cells, but which is not expressed in the cells, or is expressed at a lower level than desired.

Polynucleotide constructs are made which contain a promoter and targeting sequences, which are homologous to the 5' non-coding sequence of endogenous polynucleotide sequence, flanking the promoter. The targeting sequence will be sufficiently near the 5' end of the polynucleotide sequence so the promoter will be operably linked to the endogenous sequence upon homologous recombination. The promoter and the targeting sequences can be amplified using PCR. Preferably, the amplified promoter contains distinct restriction enzyme sites on the 5' and 3' ends. Preferably, the 3' end of the first targeting sequence contains the same restriction enzyme site as the 5' end of the amplified promoter and the 5' end of the second targeting sequence contains the same restriction site as the 3' end of the amplified promoter.

The amplified promoter and the amplified targeting sequences are digested with the appropriate restriction enzymes and subsequently treated with calf intestinal phosphatase. The digested promoter and digested targeting sequences are added together in the presence of T4 DNA ligase. The resulting mixture is maintained under conditions appropriate for ligation of the two fragments. The construct is size fractionated on an agarose gel, then purified by phenol extraction and ethanol precipitation.

In this Example, the polynucleotide constructs are administered as naked polynucleotides via electroporation. However, the polynucleotide constructs may also be administered with transfection-facilitating agents, such as liposomes, viral sequences, viral particles, precipitating agents, etc. Such methods of delivery are known in the art.

Once the cells are transfected, homologous recombination will take place which results in the promoter being operably linked to the endogenous polynucleotide sequence. This results in the expression of polynucleotide corresponding to the polynucleotide in the cell. Expression may be detected by immunological staining, or any other method known in the art.

Fibroblasts are obtained from a subject by skin biopsy. The resulting tissue is placed in DMEM + 10% fetal calf serum. Exponentially growing or early stationary phase fibroblasts are trypsinized and rinsed from the plastic surface with nutrient medium. An aliquot of the cell suspension is removed for counting, and the remaining cells are subjected to centrifugation. The supernatant is aspirated and the pellet is resuspended in 5 ml of electroporation buffer (20 mM HEPES pH 7.3, 137 mM NaCl, 5 mM KCl, 0.7 mM Na<sub>2</sub> HPO<sub>4</sub>, 6 mM dextrose). The cells are recentrifuged, the supernatant aspirated, and the cells resuspended in electroporation buffer containing 1 mg/ml acetylated bovine serum albumin. The final cell suspension contains approximately  $3 \times 10^6$  cells/ml. Electroporation should be performed immediately following resuspension.



Plasmid DNA is prepared according to standard techniques. For example, to construct a plasmid for targeting to the locus corresponding to the polynucleotide of the invention, plasmid pUC18 (MBI Fermentas, Amherst, NY) is digested with HindIII. The CMV promoter is amplified by PCR with an XbaI site on the 5' end and a BamHI site on the 3' end. Two non-coding sequences are amplified via PCR: one non-coding sequence (fragment 1) is amplified with a HindIII site at the 5' end and an Xba site at the 3' end; the other non-coding sequence (fragment 2) is amplified with a BamHI site at the 5' end and a HindIII site at the 3' end. The CMV promoter and the fragments (1 and 2) are digested with the appropriate enzymes (CMV promoter - XbaI and BamHI; fragment 1 - XbaI; fragment 2 - BamHI) and ligated together. The resulting ligation product is digested with HindIII, and ligated with the HindIII-digested pUC18 plasmid.

Plasmid DNA is added to a sterile cuvette with a 0.4 cm electrode gap (Bio-Rad). The final DNA concentration is generally at least 120 µg/ml. 0.5 ml of the cell suspension (containing approximately  $1.5 \times 10^6$  cells) is then added to the cuvette, and the cell suspension and DNA solutions are gently mixed. Electroporation is performed with a Gene-Pulser apparatus (Bio-Rad). Capacitance and voltage are set at 960 µF and 250-300 V, respectively. As voltage increases, cell survival decreases, but the percentage of surviving cells that stably incorporate the introduced DNA into their genome increases dramatically. Given these parameters, a pulse time of approximately 14-20 mSec should be observed.

Electroporated cells are maintained at room temperature for approximately 5 min, and the contents of the cuvette are then gently removed with a sterile transfer pipette. The cells are added directly to 10 ml of prewarmed nutrient media (DMEM with 15% calf serum) in a 10 cm dish and incubated at 37 degree C. The following day, the media is aspirated and replaced with 10 ml of fresh media and incubated for a further 16-24 hours.

The engineered fibroblasts are then injected into the host, either alone or after having been grown to confluence on cytodex 3 microcarrier beads. The fibroblasts now produce the protein product. The fibroblasts can then be introduced into a patient as described above.

#### *Example 18: Method of Treatment Using Gene Therapy - In Vivo*

Another aspect of the present invention is using *in vivo* gene therapy methods to prevent, treat, and/or ameliorate immune diseases and disorders. The gene therapy method relates to the introduction of naked nucleic acid (DNA, RNA, and antisense DNA or RNA) sequences into an animal to increase or decrease the expression of the polypeptide. The polynucleotide of the present invention may be operatively linked to (i.e., associated with) a promoter or any other genetic elements necessary for the expression of the polypeptide by the target tissue. Such gene therapy and delivery techniques and methods are known in the art, see, for example, WO90/11092, WO98/11779; U.S. Patent NO. 5693622, 5705151, 5580859; Tabata et al., Cardiovasc. Res.

35(3):470-479 (1997); Chao et al., Pharmacol. Res. 35(6):517-522 (1997); Wolff, Neuromuscul. Disord. 7(5):314-318 (1997); Schwartz et al., Gene Ther. 3(5):405-411 (1996); Tsurumi et al., Circulation 94(12):3281-3290 (1996) (incorporated herein by reference).

5 The polynucleotide constructs may be delivered by any method that delivers injectable materials to the cells of an animal, such as, injection into the interstitial space of tissues (heart, muscle, skin, lung, liver, intestine and the like). The polynucleotide constructs can be delivered in a pharmaceutically acceptable liquid or aqueous carrier.

10 The term "naked" polynucleotide, DNA or RNA, refers to sequences that are free from any delivery vehicle that acts to assist, promote, or facilitate entry into the cell, including viral sequences, viral particles, liposome formulations, lipofectin or precipitating agents and the like. However, the polynucleotides of the present invention may also be delivered in liposome formulations (such as those taught in Felgner P.L. et al. (1995) Ann. NY Acad. Sci. 772:126-139 and Abdallah B. et al. (1995) Biol. Cell 85(1):1-7) which can be prepared by methods well known to those skilled in the art.

15 The polynucleotide vector constructs used in the gene therapy method are preferably constructs that will not integrate into the host genome nor will they contain sequences that allow for replication. Any strong promoter known to those skilled in the art can be used for driving the expression of DNA. Unlike other gene therapy techniques, one major advantage of introducing naked nucleic acid sequences into target cells is the transitory nature of the polynucleotide synthesis in the cells. Studies have shown that non-replicating DNA sequences can be introduced  
20 into cells to provide production of the desired polypeptide for periods of up to six months.

The polynucleotide construct can be delivered to the interstitial space of tissues within an animal, including muscle, skin, brain, lung, liver, spleen, bone marrow, thymus, heart, lymph, blood, bone, cartilage, pancreas, kidney, gall bladder, stomach, intestine, testis, ovary, uterus,  
25 rectum, nervous system, eye, gland, and connective tissue. Interstitial space of the tissues comprises the intercellular fluid, mucopolysaccharide matrix among the reticular fibers of organ tissues, elastic fibers in the walls of vessels or chambers, collagen fibers of fibrous tissues, or that same matrix within connective tissue ensheathing muscle cells or in the lacunae of bone. It is similarly the space occupied by the plasma of the circulation and the lymph fluid of the lymphatic  
30 channels. Delivery to the interstitial space of muscle tissue is preferred for the reasons discussed below. They may be conveniently delivered by injection into the tissues comprising these cells. They are preferably delivered to and expressed in persistent, non-dividing cells which are differentiated, although delivery and expression may be achieved in non-differentiated or less completely differentiated cells, such as, for example, stem cells of blood or skin fibroblasts. *In vivo* muscle cells are particularly competent in their ability to take up and express polynucleotides.  
35

For the naked polynucleotide injection, an effective dosage amount of DNA or RNA

will be in the range of from about 0.05 g/kg body weight to about 50 mg/kg body weight. Preferably the dosage will be from about 0.005 mg/kg to about 20 mg/kg and more preferably from about 0.05 mg/kg to about 5 mg/kg. Of course, as the artisan of ordinary skill will appreciate, this dosage will vary according to the tissue site of injection. The appropriate and effective dosage of nucleic acid sequence can readily be determined by those of ordinary skill in the art and may depend on the condition being treated and the route of administration. The preferred route of administration is by the parenteral route of injection into the interstitial space of tissues. However, other parenteral routes may also be used, such as, inhalation of an aerosol formulation particularly for delivery to lungs or bronchial tissues, throat or mucous membranes of the nose. In addition, naked polynucleotide constructs can be delivered to arteries during angioplasty by the catheter used in the procedure.

The dose response effects of injected polynucleotide in muscle *in vivo* is determined as follows. Suitable template DNA for production of mRNA coding for polypeptide of the present invention is prepared in accordance with a standard recombinant DNA methodology. The template DNA, which may be either circular or linear, is either used as naked DNA or complexed with liposomes. The quadriceps muscles of mice are then injected with various amounts of the template DNA.

Five to six week old female and male Balb/C mice are anesthetized by intraperitoneal injection with 0.3 ml of 2.5% Avertin. A 1.5 cm incision is made on the anterior thigh, and the quadriceps muscle is directly visualized. The template DNA is injected in 0.1 ml of carrier in a 1 cc syringe through a 27 gauge needle over one minute, approximately 0.5 cm from the distal insertion site of the muscle into the knee and about 0.2 cm deep. A suture is placed over the injection site for future localization, and the skin is closed with stainless steel clips.

After an appropriate incubation time (e.g., 7 days) muscle extracts are prepared by excising the entire quadriceps. Every fifth 15  $\mu$ m cross-section of the individual quadriceps muscles is histochemically stained for protein expression. A time course for protein expression may be done in a similar fashion except that quadriceps from different mice are harvested at different times. Persistence of DNA in muscle following injection may be determined by Southern blot analysis after preparing total cellular DNA and HIRT supernatants from injected and control mice. The results of the above experimentation in mice can be used to extrapolate proper dosages and other treatment parameters in humans and other animals using naked DNA.

#### **Example 19: Transgenic Animals**

The polypeptides of the invention can also be expressed in transgenic animals. Animals of any species, including, but not limited to, mice, rats, rabbits, hamsters, guinea pigs, pigs, micro-pigs, goats, sheep, cows and non-human primates, e.g., baboons, monkeys, and

chimpanzees may be used to generate transgenic animals. In a specific embodiment, techniques described herein or otherwise known in the art, are used to express polypeptides of the invention in humans, as part of a gene therapy protocol.

Any technique known in the art may be used to introduce the transgene (i.e., polynucleotides of the invention) into animals to produce the founder lines of transgenic animals. Such techniques include, but are not limited to, pronuclear microinjection (Paterson et al., *Appl. Microbiol. Biotechnol.* 40:691-698 (1994); Carver et al., *Biotechnology (NY)* 11:1263-1270 (1993); Wright et al., *Biotechnology (NY)* 9:830-834 (1991); and Hoppe et al., U.S. Pat. No. 4,873,191 (1989)); retrovirus mediated gene transfer into germ lines (Van der Putten et al., *Proc. Natl. Acad. Sci., USA* 82:6148-6152 (1985)), blastocysts or embryos; gene targeting in embryonic stem cells (Thompson et al., *Cell* 56:313-321 (1989)); electroporation of cells or embryos (Lo, 1983, *Mol Cell. Biol.* 3:1803-1814 (1983)); introduction of the polynucleotides of the invention using a gene gun (see, e.g., Ulmer et al., *Science* 259:1745 (1993); introducing nucleic acid constructs into embryonic pluripotent stem cells and transferring the stem cells back into the blastocyst; and sperm-mediated gene transfer (Lavitrano et al., *Cell* 57:717-723 (1989); etc. For a review of such techniques, see Gordon, "Transgenic Animals," *Intl. Rev. Cytol.* 115:171-229 (1989), which is incorporated by reference herein in its entirety.

Any technique known in the art may be used to produce transgenic clones containing polynucleotides of the invention, for example, nuclear transfer into enucleated oocytes of nuclei from cultured embryonic, fetal, or adult cells induced to quiescence (Campbell et al., *Nature* 380:64-66 (1996); Wilmut et al., *Nature* 385:810-813 (1997)).

The present invention provides for transgenic animals that carry the transgene in all their cells, as well as animals which carry the transgene in some, but not all their cells, i.e., mosaic animals or chimeric. The transgene may be integrated as a single transgene or as multiple copies such as in concatamers, e.g., head-to-head tandems or head-to-tail tandems. The transgene may also be selectively introduced into and activated in a particular cell type by following, for example, the teaching of Lasko et al. (Lasko et al., *Proc. Natl. Acad. Sci. USA* 89:6232-6236 (1992)). The regulatory sequences required for such a cell-type specific activation will depend upon the particular cell type of interest, and will be apparent to those of skill in the art. When it is desired that the polynucleotide transgene be integrated into the chromosomal site of the endogenous gene, gene targeting is preferred. Briefly, when such a technique is to be utilized, vectors containing some nucleotide sequences homologous to the endogenous gene are designed for the purpose of integrating, via homologous recombination with chromosomal sequences, into and disrupting the function of the nucleotide sequence of the endogenous gene. The transgene may also be selectively introduced into a particular cell type, thus inactivating the endogenous gene in only that cell type, by following, for example, the teaching of Gu et al. (Gu et al., *Science* 265:103-106

(1994)). The regulatory sequences required for such a cell-type specific inactivation will depend upon the particular cell type of interest, and will be apparent to those of skill in the art.

Once transgenic animals have been generated, the expression of the recombinant gene may be assayed utilizing standard techniques. Initial screening may be accomplished by Southern blot analysis or PCR techniques to analyze animal tissues to verify that integration of the transgene has taken place. The level of mRNA expression of the transgene in the tissues of the transgenic animals may also be assessed using techniques which include, but are not limited to, Northern blot analysis of tissue samples obtained from the animal, *in situ* hybridization analysis, and reverse transcriptase-PCR (rt-PCR). Samples of transgenic gene-expressing tissue may also be evaluated immunocytochemically or immunohistochemically using antibodies specific for the transgene product.

Once the founder animals are produced, they may be bred, inbred, outbred, or crossbred to produce colonies of the particular animal. Examples of such breeding strategies include, but are not limited to: outbreeding of founder animals with more than one integration site in order to establish separate lines; inbreeding of separate lines in order to produce compound transgenics that express the transgene at higher levels because of the effects of additive expression of each transgene; crossing of heterozygous transgenic animals to produce animals homozygous for a given integration site in order to both augment expression and eliminate the need for screening of animals by DNA analysis; crossing of separate homozygous lines to produce compound heterozygous or homozygous lines; and breeding to place the transgene on a distinct background that is appropriate for an experimental model of interest.

Transgenic animals of the invention have uses which include, but are not limited to, animal model systems useful in elaborating the biological function of polypeptides of the present invention, studying conditions and/or disorders associated with aberrant expression, and in screening for compounds effective in ameliorating such conditions and/or disorders.

#### ***Example 20: Knock-Out Animals***

Endogenous gene expression can also be reduced by inactivating or "knocking out" the gene and/or its promoter using targeted homologous recombination. (e.g., see Smithies et al., Nature 317:230-234 (1985); Thomas & Capecchi, Cell 51:503-512 (1987); Thompson et al., Cell 5:313-321 (1989); each of which is incorporated by reference herein in its entirety). For example, a mutant, non-functional polynucleotide of the invention (or a completely unrelated DNA sequence) flanked by DNA homologous to the endogenous polynucleotide sequence (either the coding regions or regulatory regions of the gene) can be used, with or without a selectable marker and/or a negative selectable marker, to transfect cells that express polypeptides of the invention *in vivo*. In another embodiment, techniques known in the art are used to generate knockouts in cells

that contain, but do not express the gene of interest. Insertion of the DNA construct, via targeted homologous recombination, results in inactivation of the targeted gene. Such approaches are particularly suited in research and agricultural fields where modifications to embryonic stem cells can be used to generate animal offspring with an inactive targeted gene (e.g., see Thomas & 5 Capecchi 1987 and Thompson 1989, *supra*). However this approach can be routinely adapted for use in humans provided the recombinant DNA constructs are directly administered or targeted to the required site *in vivo* using appropriate viral vectors that will be apparent to those of skill in the art.

10 In further embodiments of the invention, cells that are genetically engineered to express the polypeptides of the invention, or alternatively, that are genetically engineered not to express the polypeptides of the invention (e.g., knockouts) are administered to a patient *in vivo*. Such cells may be obtained from the patient (i.e., animal, including human) or an MHC compatible donor and can include, but are not limited to fibroblasts, bone marrow cells, blood cells (e.g., lymphocytes), adipocytes, muscle cells, endothelial cells etc. The cells are genetically 15 engineered *in vitro* using recombinant DNA techniques to introduce the coding sequence of polypeptides of the invention into the cells, or alternatively, to disrupt the coding sequence and/or endogenous regulatory sequence associated with the polypeptides of the invention, e.g., by transduction (using viral vectors, and preferably vectors that integrate the transgene into the cell genome) or transfection procedures, including, but not limited to, the use of plasmids, cosmids, 20 YACs, naked DNA, electroporation, liposomes, etc. The coding sequence of the polypeptides of the invention can be placed under the control of a strong constitutive or inducible promoter or promoter/enhancer to achieve expression, and preferably secretion, of the polypeptides of the invention. The engineered cells which express and preferably secrete the polypeptides of the invention can be introduced into the patient systemically, e.g., in the circulation, or 25 intraperitoneally.

Alternatively, the cells can be incorporated into a matrix and implanted in the body, e.g., genetically engineered fibroblasts can be implanted as part of a skin graft; genetically engineered endothelial cells can be implanted as part of a lymphatic or vascular graft. (See, for example, Anderson et al. U.S. Patent No. 5,399,349; and Mulligan & Wilson, U.S. Patent No. 30 5,460,959 each of which is incorporated by reference herein in its entirety).

When the cells to be administered are non-autologous or non-MHC compatible cells, they can be administered using well known techniques which prevent the development of a host immune response against the introduced cells. For example, the cells may be introduced in an encapsulated form that, while allowing for an exchange of components with the immediate 35 extracellular environment, does not allow the introduced cells to be recognized by the host immune system.

Transgenic and "knock-out" animals of the invention have uses which include, but are not limited to, animal model systems useful in elaborating the biological function of polypeptides of the present invention, studying conditions and/or disorders associated with aberrant expression, and in screening for compounds effective in ameliorating such conditions and/or disorders.

5

***Example 21: Assays Detecting Stimulation or Inhibition of B cell Proliferation and Differentiation***

Generation of functional humoral immune responses requires both soluble and cognate signaling between B-lineage cells and their microenvironment. Signals may impart a positive stimulus that allows a B-lineage cell to continue its programmed development, or a negative stimulus that instructs the cell to arrest its current developmental pathway. To date, numerous stimulatory and inhibitory signals have been found to influence B cell responsiveness including IL-2, IL-4, IL-5, IL-6, IL-7, IL-10, IL-13, IL-14 and IL-15. Interestingly, these signals are by themselves weak effectors but can, in combination with various co-stimulatory proteins, induce activation, proliferation, differentiation, homing, tolerance and death among B cell populations.

One of the best studied classes of B-cell co-stimulatory proteins is the TNF-superfamily. Within this family CD40, CD27, and CD30 along with their respective ligands CD154, CD70, and CD153 have been found to regulate a variety of immune responses. Assays which allow for the detection and/or observation of the proliferation and differentiation of these B-cell populations and their precursors are valuable tools in determining the effects various proteins may have on these B-cell populations in terms of proliferation and differentiation. Listed below are two assays designed to allow for the detection of the differentiation, proliferation, or inhibition of B-cell populations and their precursors.

In Vitro Assay- Agonists or antagonists of the invention can be assessed for its ability to induce activation, proliferation, differentiation or inhibition and/or death in B-cell populations and their precursors. The activity of the agonists or antagonists of the invention on purified human tonsillar B cells, measured qualitatively over the dose range from 0.1 to 10,000 ng/mL, is assessed in a standard B-lymphocyte co-stimulation assay in which purified tonsillar B cells are cultured in the presence of either formalin-fixed *Staphylococcus aureus* Cowan I (SAC) or immobilized anti-human IgM antibody as the priming agent. Second signals such as IL-2 and IL-15 synergize with SAC and IgM crosslinking to elicit B cell proliferation as measured by tritiated-thymidine incorporation. Novel synergizing agents can be readily identified using this assay. The assay involves isolating human tonsillar B cells by magnetic bead (MACS) depletion of CD3-positive cells. The resulting cell population is greater than 95% B cells as assessed by expression of CD45R(B220).

Various dilutions of each sample are placed into individual wells of a 96-well plate to which are added  $10^5$  B-cells suspended in culture medium (RPMI 1640 containing 10% FBS,  $5 \times 10^{-5}$ M 2ME, 100U/ml penicillin, 10ug/ml streptomycin, and  $10^{-5}$  dilution of SAC) in a total volume of 150ul. Proliferation or inhibition is quantitated by a 20h pulse (1uCi/well) with 3H-thymidine (6.7 Ci/mM) beginning 72h post factor addition. The positive and negative controls are IL2 and medium respectively.

*In vivo* Assay- BALB/c mice are injected (i.p.) twice per day with buffer only, or 2 mg/Kg of agonists or antagonists of the invention, or truncated forms thereof. Mice receive this treatment for 4 consecutive days, at which time they are sacrificed and various tissues and serum collected for analyses. Comparison of H&E sections from normal spleens and spleens treated with agonists or antagonists of the invention identify the results of the activity of the agonists or antagonists on spleen cells, such as the diffusion of peri-arterial lymphatic sheaths, and/or significant increases in the nucleated cellularity of the red pulp regions, which may indicate the activation of the differentiation and proliferation of B-cell populations. Immunohistochemical studies using a B cell marker, anti-CD45R(B220), are used to determine whether any physiological changes to splenic cells, such as splenic disorganization, are due to increased B-cell representation within loosely defined B-cell zones that infiltrate established T-cell regions.

Flow cytometric analyses of the spleens from mice treated with agonist or antagonist is used to indicate whether the agonists or antagonists specifically increases the proportion of ThB+, CD45R(B220)dull B cells over that which is observed in control mice.

Likewise, a predicted consequence of increased mature B-cell representation *in vivo* is a relative increase in serum Ig titers. Accordingly, serum IgM and IgA levels are compared between buffer and agonists or antagonists-treated mice.

The studies described in this example tested activity of agonists or antagonists of the invention. However, one skilled in the art could easily modify the exemplified studies to test the activity of polynucleotides or polypeptides of the invention (e.g., gene therapy).

#### **Example 22: T Cell Proliferation Assay**

A CD3-induced proliferation assay is performed on PBMCs and is measured by the uptake of  $^3$ H-thymidine. The assay is performed as follows. Ninety-six well plates are coated with 100  $\mu$ l/well of mAb to CD3 (HIT3a, Pharmingen) or isotype-matched control mAb (B33.1) overnight at 4 degrees C (1  $\mu$ g/ml in .05M bicarbonate buffer, pH 9.5), then washed three times with PBS. PBMC are isolated by F/H gradient centrifugation from human peripheral blood and added to quadruplicate wells ( $5 \times 10^4$ /well) of mAb coated plates in RPMI containing 10% FCS and P/S in the presence of varying concentrations of agonists or antagonists of the invention (total volume 200 ul). Relevant protein buffer and medium alone are controls. After 48 hr. culture at 37



degrees C, plates are spun for 2 min. at 1000 rpm and 100 µl of supernatant is removed and stored  
 –20 degrees C for measurement of IL-2 (or other cytokines) if effect on proliferation is observed.  
 Wells are supplemented with 100 ul of medium containing 0.5 uCi of <sup>3</sup>H-thymidine and cultured at  
 37 degrees C for 18-24 hr. Wells are harvested and incorporation of <sup>3</sup>H-thymidine used as a  
 5 measure of proliferation. Anti-CD3 alone is the positive control for proliferation. IL-2 (100 U/ml)  
 is also used as a control which enhances proliferation. Control antibody which does not induce  
 proliferation of T cells is used as the negative control for the effects of agonists or antagonists of  
 the invention.

The studies described in this example tested activity of agonists or antagonists of the  
 10 invention. However, one skilled in the art could easily modify the exemplified studies to test the  
 activity of polynucleotides or polypeptides of the invention (e.g., gene therapy).

**Example 23: Effect of Agonists or Antagonists of the Invention on the Expression of MHC  
 15 Class II, Costimulatory and Adhesion Molecules and Cell Differentiation of Monocytes and  
 Monocyte-Derived Human Dendritic Cells**

Dendritic cells are generated by the expansion of proliferating precursors found in the  
 peripheral blood: adherent PBMC or elutriated monocytic fractions are cultured for 7-10 days with  
 GM-CSF (50 ng/ml) and IL-4 (20 ng/ml). These dendritic cells have the characteristic phenotype of  
 20 immature cells (expression of CD1, CD80, CD86, CD40 and MHC class II antigens). Treatment with  
 activating factors, such as TNF-α, causes a rapid change in surface phenotype (increased expression of  
 MHC class I and II, costimulatory and adhesion molecules, downregulation of FCγRII, upregulation of  
 CD83). These changes correlate with increased antigen-presenting capacity and with functional  
 maturation of the dendritic cells.

25 FACS analysis of surface antigens is performed as follows. Cells are treated 1-3 days with  
 increasing concentrations of agonist or antagonist of the invention or LPS (positive control), washed  
 with PBS containing 1% BSA and 0.02 mM sodium azide, and then incubated with 1:20 dilution of  
 appropriate FITC- or PE-labeled monoclonal antibodies for 30 minutes at 4 degrees C. After an  
 additional wash, the labeled cells are analyzed by flow cytometry on a FACScan (Becton Dickinson).

30 Effect on the production of cytokines. Cytokines generated by dendritic cells, in  
 particular IL-12, are important in the initiation of T-cell dependent immune responses. IL-12  
 strongly influences the development of Th1 helper T-cell immune response, and induces cytotoxic  
 T and NK cell function. An ELISA is used to measure the IL-12 release as follows. Dendritic  
 35 cells (10<sup>6</sup>/ml) are treated with increasing concentrations of agonists or antagonists of the invention  
 for 24 hours. LPS (100 ng/ml) is added to the cell culture as positive control. Supernatants from

the cell cultures are then collected and analyzed for IL-12 content using commercial ELISA kit (e.g., R & D Systems (Minneapolis, MN)). The standard protocols provided with the kits are used.

Effect on the expression of MHC Class II, costimulatory and adhesion molecules.

- 5 Three major families of cell surface antigens can be identified on monocytes: adhesion molecules, molecules involved in antigen presentation, and Fc receptor. Modulation of the expression of MHC class II antigens and other costimulatory molecules, such as B7 and ICAM-1, may result in changes in the antigen presenting capacity of monocytes and ability to induce T cell activation. Increased expression of Fc receptors may correlate with improved monocyte cytotoxic activity,  
10 cytokine release and phagocytosis.

- FACS analysis is used to examine the surface antigens as follows. Monocytes are treated 1-5 days with increasing concentrations of agonists or antagonists of the invention or LPS (positive control), washed with PBS containing 1% BSA and 0.02 mM sodium azide, and then incubated with 1:20 dilution of appropriate FITC- or PE-labeled monoclonal antibodies for 30  
15 minutes at 4 degrees C. After an additional wash, the labeled cells are analyzed by flow cytometry on a FACScan (Becton Dickinson).

- Monocyte activation and/or increased survival. Assays for molecules that activate (or alternatively, inactivate) monocytes and/or increase monocyte survival (or alternatively, decrease  
20 monocyte survival) are known in the art and may routinely be applied to determine whether a molecule of the invention functions as an inhibitor or activator of monocytes. Agonists or antagonists of the invention can be screened using the three assays described below. For each of these assays, Peripheral blood mononuclear cells (PBMC) are purified from single donor leukopacks (American Red Cross, Baltimore, MD) by centrifugation through a Histopaque  
25 gradient (Sigma). Monocytes are isolated from PBMC by counterflow centrifugal elutriation.

- Monocyte Survival Assay. Human peripheral blood monocytes progressively lose viability when cultured in absence of serum or other stimuli. Their death results from internally regulated processes (apoptosis). Addition to the culture of activating factors, such as TNF-alpha  
30 dramatically improves cell survival and prevents DNA fragmentation. Propidium iodide (PI) staining is used to measure apoptosis as follows. Monocytes are cultured for 48 hours in polypropylene tubes in serum-free medium (positive control), in the presence of 100 ng/ml TNF-alpha (negative control), and in the presence of varying concentrations of the compound to be tested. Cells are suspended at a concentration of  $2 \times 10^6$ /ml in PBS containing PI at a final  
35 concentration of 5 µg/ml, and then incubated at room temperature for 5 minutes before FACScan

analysis. PI uptake has been demonstrated to correlate with DNA fragmentation in this experimental paradigm.

Effect on cytokine release. An important function of monocytes/macrophages is their regulatory activity on other cellular populations of the immune system through the release of cytokines after stimulation. An ELISA to measure cytokine release is performed as follows. Human monocytes are incubated at a density of  $5 \times 10^5$  cells/ml with increasing concentrations of agonists or antagonists of the invention and under the same conditions, but in the absence of agonists or antagonists. For IL-12 production, the cells are primed overnight with IFN (100 U/ml) in the presence of agonist or antagonist of the invention. LPS (10 ng/ml) is then added. Conditioned media are collected after 24h and kept frozen until use. Measurement of TNF-alpha, IL-10, MCP-1 and IL-8 is then performed using a commercially available ELISA kit (e.g., R & D Systems (Minneapolis, MN)) and applying the standard protocols provided with the kit.

Oxidative burst. Purified monocytes are plated in 96-w plate at  $2 \times 10^5$  cell/well. Increasing concentrations of agonists or antagonists of the invention are added to the wells in a total volume of 0.2 ml culture medium (RPMI 1640 + 10% FCS, glutamine and antibiotics). After 3 days incubation, the plates are centrifuged and the medium is removed from the wells. To the macrophage monolayers, 0.2 ml per well of phenol red solution (140 mM NaCl, 10 mM potassium phosphate buffer pH 7.0, 5.5 mM dextrose, 0.56 mM phenol red and 19 U/ml of HRP) is added, together with the stimulant (200 nM PMA). The plates are incubated at 37°C for 2 hours and the reaction is stopped by adding 20  $\mu$ l 1N NaOH per well. The absorbance is read at 610 nm. To calculate the amount of  $H_2O_2$  produced by the macrophages, a standard curve of a  $H_2O_2$  solution of known molarity is performed for each experiment.

The studies described in this example tested activity of agonists or antagonists of the invention. However, one skilled in the art could easily modify the exemplified studies to test the activity of polynucleotides or polypeptides of the invention (e.g., gene therapy).

***Example 24: Biological Effects of Agonists or Antagonists of the Invention***

**Astrocyte and Neuronal Assays**

Agonists or antagonists of the invention, expressed in *Escherichia coli* and purified as described above, can be tested for activity in promoting the survival, neurite outgrowth, or phenotypic differentiation of cortical neuronal cells and for inducing the proliferation of glial fibrillary acidic protein immunopositive cells, astrocytes. The selection of cortical cells for the bioassay is based on the prevalent expression of FGF-1 and FGF-2 in cortical structures and on the previously reported enhancement of cortical neuronal survival resulting from FGF-2 treatment. A thymidine incorporation assay, for example, can be used to elucidate an agonist or antagonist of the invention's activity on these cells.

Moreover, previous reports describing the biological effects of FGF-2 (basic FGF) on cortical or hippocampal neurons *in vitro* have demonstrated increases in both neuron survival and neurite outgrowth (Walicke et al., "Fibroblast growth factor promotes survival of dissociated hippocampal neurons and enhances neurite extension." *Proc. Natl. Acad. Sci. USA* 83:3012-3016. (1986), assay herein incorporated by reference in its entirety). However, reports from experiments done on PC-12 cells suggest that these two responses are not necessarily synonymous and may depend on not only which FGF is being tested but also on which receptor(s) are expressed on the target cells. Using the primary cortical neuronal culture paradigm, the ability of an agonist or antagonist of the invention to induce neurite outgrowth can be compared to the response achieved with FGF-2 using, for example, a thymidine incorporation assay.

**Fibroblast and endothelial cell assays**

Human lung fibroblasts are obtained from Clonetics (San Diego, CA) and maintained in growth media from Clonetics. Dermal microvascular endothelial cells are obtained from Cell Applications (San Diego, CA). For proliferation assays, the human lung fibroblasts and dermal microvascular endothelial cells can be cultured at 5,000 cells/well in a 96-well plate for one day in growth medium. The cells are then incubated for one day in 0.1% BSA basal medium. After replacing the medium with fresh 0.1% BSA medium, the cells are incubated with the test proteins for 3 days. Alamar Blue (Alamar Biosciences, Sacramento, CA) is added to each well to a final concentration of 10%. The cells are incubated for 4 hr. Cell viability is measured by reading in a CytoFluor fluorescence reader. For the PGE<sub>2</sub> assays, the human lung fibroblasts are cultured at 5,000 cells/well in a 96-well plate for one day. After a medium change to 0.1% BSA basal medium, the cells are incubated with FGF-2 or agonists or antagonists of the invention with or without IL-1 $\alpha$  for 24 hours.

The supernatants are collected and assayed for PGE<sub>2</sub> by EIA kit (Cayman, Ann Arbor, MI). For the IL-6 assays, the human lung fibroblasts are cultured at 5,000 cells/well in a 96-well plate for one day. After a medium change to 0.1% BSA basal medium, the cells are incubated with FGF-2 or with or without agonists or antagonists of the invention IL-1 $\alpha$  for 24 hours. The supernatants are collected and assayed for IL-6 by ELISA kit (Endogen, Cambridge, MA).

Human lung fibroblasts are cultured with FGF-2 or agonists or antagonists of the invention for 3 days in basal medium before the addition of Alamar Blue to assess effects on growth of the fibroblasts. FGF-2 should show a stimulation at 10 - 2500 ng/ml which can be used to compare stimulation with agonists or antagonists of the invention.

#### Parkinson Models.

The loss of motor function in Parkinson's disease is attributed to a deficiency of striatal dopamine resulting from the degeneration of the nigrostriatal dopaminergic projection neurons. An animal model for Parkinson's that has been extensively characterized involves the systemic administration of 1-methyl-4 phenyl 1,2,3,6-tetrahydropyridine (MPTP). In the CNS, MPTP is taken-up by astrocytes and catabolized by monoamine oxidase B to 1-methyl-4-phenyl pyridine (MPP<sup>+</sup>) and released. Subsequently, MPP<sup>+</sup> is actively accumulated in dopaminergic neurons by the high-affinity reuptake transporter for dopamine. MPP<sup>+</sup> is then concentrated in mitochondria by the electrochemical gradient and selectively inhibits nicotinamide adenine disphosphate: ubiquinone oxidoreductionase (complex I), thereby interfering with electron transport and eventually generating oxygen radicals.

It has been demonstrated in tissue culture paradigms that FGF-2 (basic FGF) has trophic activity towards nigral dopaminergic neurons (Ferrari et al., Dev. Biol. 1989). Recently, Dr. Unsicker's group has demonstrated that administering FGF-2 in gel foam implants in the striatum results in the near complete protection of nigral dopaminergic neurons from the toxicity associated with MPTP exposure (Otto and Unsicker, J. Neuroscience, 1990).

Based on the data with FGF-2, agonists or antagonists of the invention can be evaluated to determine whether it has an action similar to that of FGF-2 in enhancing dopaminergic neuronal survival *in vitro* and it can also be tested *in vivo* for protection of dopaminergic neurons in the striatum from the damage associated with MPTP treatment. The potential effect of an agonist or antagonist of the invention is first examined *in vitro* in a dopaminergic neuronal cell culture paradigm. The cultures are prepared by dissecting the midbrain floor plate from gestation day 14 Wistar rat embryos. The tissue is dissociated with trypsin and seeded at a density of 200,000 cells/cm<sup>2</sup> on polyorthinine-laminin coated glass coverslips. The cells are maintained in Dulbecco's Modified Eagle's medium and F12 medium containing hormonal supplements (N1). The cultures are fixed with paraformaldehyde after 8 days *in vitro* and are processed for tyrosine hydroxylase, a specific marker for dopaminergic neurons,

immunohistochemical staining. Dissociated cell cultures are prepared from embryonic rats. The culture medium is changed every third day and the factors are also added at that time.

Since the dopaminergic neurons are isolated from animals at gestation day 14, a developmental time which is past the stage when the dopaminergic precursor cells are proliferating, an increase in the number of tyrosine hydroxylase immunopositive neurons would represent an increase in the number of dopaminergic neurons surviving *in vitro*. Therefore, if an agonist or antagonist of the invention acts to prolong the survival of dopaminergic neurons, it would suggest that the agonist or antagonist may be involved in Parkinson's Disease.

The studies described in this example tested activity of agonists or antagonists of the invention. However, one skilled in the art could easily modify the exemplified studies to test the activity of polynucleotides or polypeptides of the invention (e.g., gene therapy).

**Example 25: The Effect of Agonists or Antagonists of the Invention on the Growth of Vascular Endothelial Cells**

On day 1, human umbilical vein endothelial cells (HUVEC) are seeded at  $2.5 \times 10^4$  cells/35 mm dish density in M199 medium containing 4% fetal bovine serum (FBS), 16 units/ml heparin, and 50 units/ml endothelial cell growth supplements (ECGS, Biotechnology, Inc.). On day 2, the medium is replaced with M199 containing 10% FBS, 8 units/ml heparin. An agonist or antagonist of the invention, and positive controls, such as VEGF and basic FGF (bFGF) are added, at varying concentrations. On days 4 and 6, the medium is replaced. On day 8, cell number is determined with a Coulter Counter.

An increase in the number of HUVEC cells indicates that the compound of the invention may proliferate vascular endothelial cells, while a decrease in the number of HUVEC cells indicates that the compound of the invention inhibits vascular endothelial cells.

The studies described in this example tested activity of a polypeptide of the invention. However, one skilled in the art could easily modify the exemplified studies to test the activity of polynucleotides (e.g., gene therapy), agonists, and/or antagonists of the invention.

**Example 26: Rat Corneal Wound Healing Model**

This animal model shows the effect of an agonist or antagonist of the invention on neovascularization. The experimental protocol includes:

- a) Making a 1-1.5 mm long incision from the center of cornea into the stromal layer.
- b) Inserting a spatula below the lip of the incision facing the outer corner of the eye.
- c) Making a pocket (its base is 1-1.5 mm from the edge of the eye).

d) Positioning a pellet, containing 50ng- 5ug of an agonist or antagonist of the invention, within the pocket.

e) Treatment with an agonist or antagonist of the invention can also be applied topically to the corneal wounds in a dosage range of 20mg - 500mg (daily treatment for five days).

5 The studies described in this example tested activity of agonists or antagonists of the invention. However, one skilled in the art could easily modify the exemplified studies to test the activity of polynucleotides or polypeptides of the invention (e.g., gene therapy).

#### **Example 27: Diabetic Mouse and Glucocorticoid-Impaired**

##### **10 Wound Healing Models**

###### *Diabetic db+/db+ Mouse Model.*

To demonstrate that an agonist or antagonist of the invention accelerates the healing process, the genetically diabetic mouse model of wound healing is used. The full thickness wound healing model in the db+/db+ mouse is a well characterized, clinically relevant and reproducible model of impaired wound healing. Healing of the diabetic wound is dependent on formation of granulation tissue and re-epithelialization rather than contraction (Gartner, M.H. *et al.*, *J. Surg. Res.* 52:389 (1992); Greenhalgh, D.G. *et al.*, *Am. J. Pathol.* 136:1235 (1990)).

The diabetic animals have many of the characteristic features observed in Type II diabetes mellitus. Homozygous (db+/db+) mice are obese in comparison to their normal heterozygous (db+/+m) littermates. Mutant diabetic (db+/db+) mice have a single autosomal recessive mutation on chromosome 4 (db+) (Coleman *et al. Proc. Natl. Acad. Sci. USA* 77:283-293 (1982)). Animals show polyphagia, polydipsia and polyuria. Mutant diabetic mice (db+/db+) have elevated blood glucose, increased or normal insulin levels, and suppressed cell-mediated immunity (Mandel *et al.*, *J. Immunol.* 120:1375 (1978); Debray-Sachs, M. *et al.*, *Clin. Exp. Immunol.* 51(1):1-7 (1983); Leiter *et al.*, *Am. J. of Pathol.* 114:46-55 (1985)). Peripheral neuropathy, myocardial complications, and microvascular lesions, basement membrane thickening and glomerular filtration abnormalities have been described in these animals (Norido, F. *et al.*, *Exp. Neurol.* 83(2):221-232 (1984); Robertson *et al.*, *Diabetes* 29(1):60-67 (1980); Giacomelli *et al.*, *Lab Invest.* 40(4):460-473 (1979); Coleman, D.L., *Diabetes* 31 (Suppl):1-6 (1982)). These homozygous diabetic mice develop hyperglycemia that is resistant to insulin analogous to human type II diabetes (Mandel *et al.*, *J. Immunol.* 120:1375-1377 (1978)).

The characteristics observed in these animals suggests that healing in this model may be similar to the healing observed in human diabetes (Greenhalgh, *et al.*, *Am. J. of Pathol.* 136:1235-1246 (1990)).

Genetically diabetic female C57BL/KsJ (db+/db+) mice and their non-diabetic (db+/+m) heterozygous littermates are used in this study (Jackson Laboratories). The animals are purchased at 6 weeks of age and are 8 weeks old at the beginning of the study. Animals are individually housed and

received food and water ad libitum. All manipulations are performed using aseptic techniques. The experiments are conducted according to the rules and guidelines of Human Genome Sciences, Inc. Institutional Animal Care and Use Committee and the Guidelines for the Care and Use of Laboratory Animals.

5           Wounding protocol is performed according to previously reported methods (Tsuboi, R. and Rifkin, D.B., *J. Exp. Med.* 172:245-251 (1990)). Briefly, on the day of wounding, animals are anesthetized with an intraperitoneal injection of Avertin (0.01 mg/mL), 2,2,2-tribromoethanol and 2-methyl-2-butanol dissolved in deionized water. The dorsal region of the animal is shaved and the skin washed with 70% ethanol solution and iodine. The surgical area is dried with sterile gauze prior to  
10   wounding. An 8 mm full-thickness wound is then created using a Keyes tissue punch. Immediately following wounding, the surrounding skin is gently stretched to eliminate wound expansion. The wounds are left open for the duration of the experiment. Application of the treatment is given topically for 5 consecutive days commencing on the day of wounding. Prior to treatment, wounds are gently cleansed with sterile saline and gauze sponges.

15           Wounds are visually examined and photographed at a fixed distance at the day of surgery and at two day intervals thereafter. Wound closure is determined by daily measurement on days 1-5 and on day 8. Wounds are measured horizontally and vertically using a calibrated Jameson caliper. Wounds are considered healed if granulation tissue is no longer visible and the wound is covered by a continuous epithelium.

20           An agonist or antagonist of the invention is administered using at a range different doses, from 4mg to 500mg per wound per day for 8 days in vehicle. Vehicle control groups received 50mL of vehicle solution.

          Animals are euthanized on day 8 with an intraperitoneal injection of sodium pentobarbital (300mg/kg). The wounds and surrounding skin are then harvested for histology and  
25   immunohistochemistry. Tissue specimens are placed in 10% neutral buffered formalin in tissue cassettes between biopsy sponges for further processing.

          Three groups of 10 animals each (5 diabetic and 5 non-diabetic controls) are evaluated: 1) Vehicle placebo control, 2) untreated group, and 3) treated group.

          Wound closure is analyzed by measuring the area in the vertical and horizontal axis and  
30   obtaining the total square area of the wound. Contraction is then estimated by establishing the differences between the initial wound area (day 0) and that of post treatment (day 8). The wound area on day 1 is 64mm<sup>2</sup>, the corresponding size of the dermal punch. Calculations are made using the following formula:

35           
$$[\text{Open area on day 8}] - [\text{Open area on day 1}] / [\text{Open area on day 1}]$$



Specimens are fixed in 10% buffered formalin and paraffin embedded blocks are sectioned perpendicular to the wound surface (5mm) and cut using a Reichert-Jung microtome. Routine hematoxylin-eosin (H&E) staining is performed on cross-sections of bisected wounds. Histologic examination of the wounds are used to assess whether the healing process and the morphologic appearance of the repaired skin is altered by treatment with an agonist or antagonist of the invention. This assessment included verification of the presence of cell accumulation, inflammatory cells, capillaries, fibroblasts, re-epithelialization and epidermal maturity (Greenhalgh, D.G. *et al.*, *Am. J. Pathol.* 136:1235 (1990)). A calibrated lens micrometer is used by a blinded observer.

Tissue sections are also stained immunohistochemically with a polyclonal rabbit anti-human keratin antibody using ABC Elite detection system. Human skin is used as a positive tissue control while non-immune IgG is used as a negative control. Keratinocyte growth is determined by evaluating the extent of reepithelialization of the wound using a calibrated lens micrometer.

Proliferating cell nuclear antigen/cyclin (PCNA) in skin specimens is demonstrated by using anti-PCNA antibody (1:50) with an ABC Elite detection system. Human colon cancer served as a positive tissue control and human brain tissue is used as a negative tissue control. Each specimen included a section with omission of the primary antibody and substitution with non-immune mouse IgG. Ranking of these sections is based on the extent of proliferation on a scale of 0-8, the lower side of the scale reflecting slight proliferation to the higher side reflecting intense proliferation.

Experimental data are analyzed using an unpaired t test. A p value of < 0.05 is considered significant.

#### *Steroid Impaired Rat Model*

The inhibition of wound healing by steroids has been well documented in various *in vitro* and *in vivo* systems (Wahl, Glucocorticoids and Wound healing. In: Anti-Inflammatory Steroid Action: Basic and Clinical Aspects. 280-302 (1989); Wahl *et al.*, *J. Immunol.* 115: 476-481 (1975); Werb *et al.*, *J. Exp. Med.* 147:1684-1694 (1978)). Glucocorticoids retard wound healing by inhibiting angiogenesis, decreasing vascular permeability (Ebert *et al.*, *An. Intern. Med.* 37:701-705 (1952)), fibroblast proliferation, and collagen synthesis (Beck *et al.*, *Growth Factors.* 5: 295-304 (1991); Haynes *et al.*, *J. Clin. Invest.* 61: 703-797 (1978)) and producing a transient reduction of circulating monocytes (Haynes *et al.*, *J. Clin. Invest.* 61: 703-797 (1978); Wahl, "Glucocorticoids and wound healing", In: Antiinflammatory Steroid Action: Basic and Clinical Aspects, Academic Press, New York, pp. 280-302 (1989)). The systemic administration of steroids to impaired wound healing is a well establish phenomenon in rats (Beck *et al.*, *Growth Factors.* 5: 295-304 (1991); Haynes *et al.*, *J. Clin. Invest.* 61: 703-797 (1978); Wahl, "Glucocorticoids and wound healing", In: Antiinflammatory Steroid Action: Basic and Clinical Aspects, Academic Press, New York, pp. 280-302 (1989); Pierce *et al.*, *Proc. Natl. Acad. Sci. USA* 86: 2229-2233 (1989)).

To demonstrate that an agonist or antagonist of the invention can accelerate the healing process, the effects of multiple topical applications of the agonist or antagonist on full thickness excisional skin wounds in rats in which healing has been impaired by the systemic administration of methylprednisolone is assessed.

5           Young adult male Sprague Dawley rats weighing 250-300 g (Charles River Laboratories) are used in this example. The animals are purchased at 8 weeks of age and are 9 weeks old at the beginning of the study. The healing response of rats is impaired by the systemic administration of methylprednisolone (17mg/kg/rat intramuscularly) at the time of wounding. Animals are individually  
10           housed and received food and water *ad libitum*. All manipulations are performed using aseptic techniques. This study is conducted according to the rules and guidelines of Human Genome Sciences, Inc. Institutional Animal Care and Use Committee and the Guidelines for the Care and Use of Laboratory Animals.

          The wounding protocol is followed according to section A, above. On the day of wounding, animals are anesthetized with an intramuscular injection of ketamine (50 mg/kg) and  
15           xylazine (5 mg/kg). The dorsal region of the animal is shaved and the skin washed with 70% ethanol and iodine solutions. The surgical area is dried with sterile gauze prior to wounding. An 8 mm full-thickness wound is created using a Keyes tissue punch. The wounds are left open for the duration of the experiment. Applications of the testing materials are given topically once a day for 7 consecutive  
20           days commencing on the day of wounding and subsequent to methylprednisolone administration. Prior to treatment, wounds are gently cleansed with sterile saline and gauze sponges.

          Wounds are visually examined and photographed at a fixed distance at the day of wounding and at the end of treatment. Wound closure is determined by daily measurement on days 1-5 and on day 8. Wounds are measured horizontally and vertically using a calibrated Jameson caliper. Wounds are considered healed if granulation tissue is no longer visible and the wound is covered by a  
25           continuous epithelium.

          The agonist or antagonist of the invention is administered using at a range different doses, from 4mg to 500mg per wound per day for 8 days in vehicle. Vehicle control groups received 50mL of vehicle solution.

          Animals are euthanized on day 8 with an intraperitoneal injection of sodium pentobarbital  
30           (300mg/kg). The wounds and surrounding skin are then harvested for histology. Tissue specimens are placed in 10% neutral buffered formalin in tissue cassettes between biopsy sponges for further processing.

          Three groups of 10 animals each (5 with methylprednisolone and 5 without glucocorticoid) are evaluated: 1) Untreated group 2) Vehicle placebo control 3) treated groups.

35           Wound closure is analyzed by measuring the area in the vertical and horizontal axis and obtaining the total area of the wound. Closure is then estimated by establishing the differences between

the initial wound area (day 0) and that of post treatment (day 8). The wound area on day 1 is 64mm<sup>2</sup>, the corresponding size of the dermal punch. Calculations are made using the following formula:

$$[\text{Open area on day 8}] - [\text{Open area on day 1}] / [\text{Open area on day 1}]$$

5

Specimens are fixed in 10% buffered formalin and paraffin embedded blocks are sectioned perpendicular to the wound surface (5mm) and cut using an Olympus microtome. Routine hematoxylin-eosin (H&E) staining is performed on cross-sections of bisected wounds. Histologic examination of the wounds allows assessment of whether the healing process and the morphologic appearance of the repaired skin is improved by treatment with an agonist or antagonist of the invention. A calibrated lens micrometer is used by a blinded observer to determine the distance of the wound gap.

10

Experimental data are analyzed using an unpaired t test. A p value of < 0.05 is considered significant.

15

The studies described in this example tested activity of agonists or antagonists of the invention. However, one skilled in the art could easily modify the exemplified studies to test the activity of polynucleotides or polypeptides of the invention (e.g., gene therapy).

#### *Example 28: Lymphadema Animal Model*

The purpose of this experimental approach is to create an appropriate and consistent lymphedema model for testing the therapeutic effects of an agonist or antagonist of the invention in lymphangiogenesis and re-establishment of the lymphatic circulatory system in the rat hind limb. Effectiveness is measured by swelling volume of the affected limb, quantification of the amount of lymphatic vasculature, total blood plasma protein, and histopathology. Acute lymphedema is observed for 7-10 days. Perhaps more importantly, the chronic progress of the edema is followed for up to 3-4 weeks.

25

Prior to beginning surgery, blood sample is drawn for protein concentration analysis. Male rats weighing approximately ~350g are dosed with Pentobarbital. Subsequently, the right legs are shaved from knee to hip. The shaved area is swabbed with gauze soaked in 70% EtOH. Blood is drawn for serum total protein testing. Circumference and volumetric measurements are made prior to injecting dye into paws after marking 2 measurement levels (0.5 cm above heel, at mid-pt of dorsal paw). The intradermal dorsum of both right and left paws are injected with 0.05 ml of 1% Evan's Blue. Circumference and volumetric measurements are then made following injection of dye into paws.

30

Using the knee joint as a landmark, a mid-leg inguinal incision is made circumferentially allowing the femoral vessels to be located. Forceps and hemostats are used to dissect and separate the skin flaps. After locating the femoral vessels, the lymphatic vessel that runs along side and underneath

35

the vessel(s) is located. The main lymphatic vessels in this area are then electrically coagulated or suture ligated.

5 Using a microscope, muscles in back of the leg (near the semitendinosus and adductors) are bluntly dissected. The popliteal lymph node is then located. The 2 proximal and 2 distal lymphatic vessels and distal blood supply of the popliteal node are then ligated by suturing. The popliteal lymph node, and any accompanying adipose tissue, is then removed by cutting connective tissues.

10 Care is taken to control any mild bleeding resulting from this procedure. After lymphatics are occluded, the skin flaps are sealed by using liquid skin (Vetbond) (AJ Buck). The separated skin edges are sealed to the underlying muscle tissue while leaving a gap of ~0.5 cm around the leg. Skin also may be anchored by suturing to underlying muscle when necessary.

To avoid infection, animals are housed individually with mesh (no bedding). Recovering animals are checked daily through the optimal edematous peak, which typically occurred by day 5-7. The plateau edematous peak are then observed. To evaluate the intensity of the lymphedema, the circumference and volumes of 2 designated places on each paw before operation and daily for 7 days are measured. The effect of plasma proteins on lymphedema is determined and whether protein analysis is a useful testing perimeter is also investigated. The weights of both control and edematous limbs are evaluated at 2 places. Analysis is performed in a blind manner.

20 Circumference Measurements: Under brief gas anesthetic to prevent limb movement, a cloth tape is used to measure limb circumference. Measurements are done at the ankle bone and dorsal paw by 2 different people and those 2 readings are averaged. Readings are taken from both control and edematous limbs.

25 Volumetric Measurements: On the day of surgery, animals are anesthetized with Pentobarbital and are tested prior to surgery. For daily volumetrics animals are under brief halothane anesthetic (rapid immobilization and quick recovery), and both legs are shaved and equally marked using waterproof marker on legs. Legs are first dipped in water, then dipped into instrument to each marked level then measured by Buxco edema software (Chen/Victor). Data is recorded by one person, while the other is dipping the limb to marked area.

Blood-plasma protein measurements: Blood is drawn, spun, and serum separated prior to surgery and then at conclusion for total protein and  $\text{Ca}^{2+}$  comparison.

30 Limb Weight Comparison: After drawing blood, the animal is prepared for tissue collection. The limbs are amputated using a quillitine, then both experimental and control legs are cut at the ligature and weighed. A second weighing is done as the tibio-cacaneal joint is disarticulated and the foot is weighed.

35 Histological Preparations: The transverse muscle located behind the knee (popliteal) area is dissected and arranged in a metal mold, filled with freezeGel, dipped into cold methylbutane, placed

into labeled sample bags at - 80EC until sectioning. Upon sectioning, the muscle is observed under fluorescent microscopy for lymphatics..

The studies described in this example tested activity of agonists or antagonists of the invention. However, one skilled in the art could easily modify the exemplified studies to test the activity of polynucleotides or polypeptides of the invention (e.g., gene therapy).

***Example 29: Suppression of TNF alpha-induced adhesion molecule expression by an Agonist or Antagonist of the Invention***

The recruitment of lymphocytes to areas of inflammation and angiogenesis involves specific receptor-ligand interactions between cell surface adhesion molecules (CAMs) on lymphocytes and the vascular endothelium. The adhesion process, in both normal and pathological settings, follows a multi-step cascade that involves intercellular adhesion molecule-1 (ICAM-1), vascular cell adhesion molecule-1 (VCAM-1), and endothelial leukocyte adhesion molecule-1 (E-selectin) expression on endothelial cells (EC). The expression of these molecules and others on the vascular endothelium determines the efficiency with which leukocytes may adhere to the local vasculature and extravasate into the local tissue during the development of an inflammatory response. The local concentration of cytokines and growth factor participate in the modulation of the expression of these CAMs.

Tumor necrosis factor alpha (TNF-a), a potent proinflammatory cytokine, is a stimulator of all three CAMs on endothelial cells and may be involved in a wide variety of inflammatory responses, often resulting in a pathological outcome.

The potential of an agonist or antagonist of the invention to mediate a suppression of TNF-a induced CAM expression can be examined. A modified ELISA assay which uses ECs as a solid phase absorbent is employed to measure the amount of CAM expression on TNF-a treated ECs when co-stimulated with a member of the FGF family of proteins.

To perform the experiment, human umbilical vein endothelial cell (HUVEC) cultures are obtained from pooled cord harvests and maintained in growth medium (EGM-2; Clonetics, San Diego, CA) supplemented with 10% FCS and 1% penicillin/streptomycin in a 37 degree C humidified incubator containing 5% CO<sub>2</sub>. HUVECs are seeded in 96-well plates at concentrations of  $1 \times 10^4$  cells/well in EGM medium at 37 degree C for 18-24 hrs or until confluent. The monolayers are subsequently washed 3 times with a serum-free solution of RPMI-1640 supplemented with 100 U/ml penicillin and 100 mg/ml streptomycin, and treated with a given cytokine and/or growth factor(s) for 24 h at 37 degree C. Following incubation, the cells are then evaluated for CAM expression.

Human Umbilical Vein Endothelial cells (HUVECs) are grown in a standard 96 well plate to confluence. Growth medium is removed from the cells and replaced with 90 ul of 199 Medium (10% FBS). Samples for testing and positive or negative controls are added to the plate in triplicate (in 10 ul volumes). Plates are incubated at 37 degree C for either 5 h (selectin and integrin expression) or

24 h (integrin expression only). Plates are aspirated to remove medium and 100  $\mu$ l of 0.1% paraformaldehyde-PBS(with Ca++ and Mg++) is added to each well. Plates are held at 4°C for 30 min.

5        Fixative is then removed from the wells and wells are washed 1X with PBS(+Ca,Mg)+0.5% BSA and drained. Do not allow the wells to dry. Add 10  $\mu$ l of diluted primary antibody to the test and control wells. Anti-ICAM-1-Biotin, Anti-VCAM-1-Biotin and Anti-E-selectin-Biotin are used at a concentration of 10  $\mu$ g/ml (1:10 dilution of 0.1 mg/ml stock antibody). Cells are incubated at 37°C for 30 min. in a humidified environment. Wells are washed X3 with PBS(+Ca,Mg)+0.5% BSA.

10        Then add 20  $\mu$ l of diluted ExtrAvidin-Alkaline Phosphatase (1:5,000 dilution) to each well and incubated at 37°C for 30 min. Wells are washed X3 with PBS(+Ca,Mg)+0.5% BSA. 1 tablet of p-Nitrophenol Phosphate pNPP is dissolved in 5 ml of glycine buffer (pH 10.4). 100  $\mu$ l of pNPP substrate in glycine buffer is added to each test well. Standard wells in triplicate are prepared from the working dilution of the ExtrAvidin-Alkaline Phosphatase in glycine buffer: 1:5,000 ( $10^0$ ) >  $10^{0.5}$  >  $10^{-1}$  >  $10^{-1.5}$ . 5  $\mu$ l of each dilution is added to triplicate wells and the resulting AP content in each well is 5.50 ng, 1.74 ng, 0.55 ng, 0.18 ng. 100  $\mu$ l of pNPP reagent must then be added to each of the standard wells. 15        The plate must be incubated at 37°C for 4h. A volume of 50  $\mu$ l of 3M NaOH is added to all wells. The results are quantified on a plate reader at 405 nm. The background subtraction option is used on blank wells filled with glycine buffer only. The template is set up to indicate the concentration of AP-conjugate in each standard well [5.50 ng; 1.74 ng; 0.55 ng; 0.18 ng]. Results are indicated as amount of bound AP-conjugate in each sample. 20

      The studies described in this example tested activity of agonists or antagonists of the invention. However, one skilled in the art could easily modify the exemplified studies to test the activity of polynucleotides or polypeptides of the invention (e.g., gene therapy).

25        ***Example 30: Production Of Polypeptide of the Invention For High-Throughput Screening Assays***

      The following protocol produces a supernatant containing polypeptide of the present invention to be tested. This supernatant can then be used in the Screening Assays described in Examples 32-41.

30        First, dilute Poly-D-Lysine (644 587 Boehringer-Mannheim) stock solution (1mg/ml in PBS) 1:20 in PBS (w/o calcium or magnesium 17-516F Biowhittaker) for a working solution of 50ug/ml. Add 200  $\mu$ l of this solution to each well (24 well plates) and incubate at RT for 20 minutes. Be sure to distribute the solution over each well (note: a 12-channel pipetter may be used with tips on every other channel). Aspirate off the Poly-D-Lysine solution and rinse with 1ml PBS 35        (Phosphate Buffered Saline). The PBS should remain in the well until just prior to plating the cells and plates may be poly-lysine coated in advance for up to two weeks.

Plate 293T cells (do not carry cells past P+20) at  $2 \times 10^5$  cells/well in .5ml DMEM(Dulbecco's Modified Eagle Medium)(with 4.5 G/L glucose and L-glutamine (12-604F Biowhittaker))/10% heat inactivated FBS(14-503F Biowhittaker)/1x Penstrep(17-602E Biowhittaker). Let the cells grow overnight.

- 5 The next day, mix together in a sterile solution basin: 300 ul Lipofectamine (18324-012 Gibco/BRL) and 5ml Optimem I (31985070 Gibco/BRL)/96-well plate. With a small volume multi-channel pipetter, aliquot approximately 2ug of an expression vector containing a polynucleotide insert, produced by the methods described in Examples 8-10, into an appropriately labeled 96-well round bottom plate. With a multi-channel pipetter, add 50ul of the
- 10 Lipofectamine/Optimem I mixture to each well. Pipette up and down gently to mix. Incubate at RT 15-45 minutes. After about 20 minutes, use a multi-channel pipetter to add 150ul Optimem I to each well. As a control, one plate of vector DNA lacking an insert should be transfected with each set of transfections.

- Preferably, the transfection should be performed by tag-teaming the following tasks.
- 15 By tag-teaming, hands on time is cut in half, and the cells do not spend too much time on PBS. First, person A aspirates off the media from four 24-well plates of cells, and then person B rinses each well with .5-1ml PBS. Person A then aspirates off PBS rinse, and person B, using a 12-channel pipetter with tips on every other channel, adds the 200ul of DNA/Lipofectamine/Optimem I complex to the odd wells first, then to the even wells, to each row on the 24-well plates.
- 20 Incubate at 37 degree C for 6 hours.

- While cells are incubating, prepare appropriate media, either 1%BSA in DMEM with 1x penstrep, or HGS CHO-5 media (116.6 mg/L of CaCl<sub>2</sub> (anhyd); 0.00130 mg/L CuSO<sub>4</sub>·5H<sub>2</sub>O; 0.050 mg/L of Fe(NO<sub>3</sub>)<sub>3</sub>·9H<sub>2</sub>O; 0.417 mg/L of FeSO<sub>4</sub>·7H<sub>2</sub>O; 311.80 mg/L of KCl; 28.64 mg/L of MgCl<sub>2</sub>; 48.84 mg/L of MgSO<sub>4</sub>; 6995.50 mg/L of NaCl; 2400.0 mg/L of NaHCO<sub>3</sub>; 62.50 mg/L
- 25 of NaH<sub>2</sub>PO<sub>4</sub>·H<sub>2</sub>O; 71.02 mg/L of Na<sub>2</sub>HPO<sub>4</sub>; .4320 mg/L of ZnSO<sub>4</sub>·7H<sub>2</sub>O; .002 mg/L of Arachidonic Acid ; 1.022 mg/L of Cholesterol; .070 mg/L of DL-alpha-Tocopherol-Acetate; 0.0520 mg/L of Linoleic Acid; 0.010 mg/L of Linolenic Acid; 0.010 mg/L of Myristic Acid; 0.010 mg/L of Oleic Acid; 0.010 mg/L of Palmitic Acid; 0.010 mg/L of Palmitic Acid; 100 mg/L of Pluronic F-68; 0.010 mg/L of Stearic Acid; 2.20 mg/L of Tween 80; 4551 mg/L of D-Glucose;
- 30 130.85 mg/ml of L- Alanine; 147.50 mg/ml of L-Arginine-HCL; 7.50 mg/ml of L-Asparagine-H<sub>2</sub>O; 6.65 mg/ml of L-Aspartic Acid; 29.56 mg/ml of L-Cystine-2HCL-H<sub>2</sub>O; 31.29 mg/ml of L-Cystine-2HCL; 7.35 mg/ml of L-Glutamic Acid; 365.0 mg/ml of L-Glutamine; 18.75 mg/ml of Glycine; 52.48 mg/ml of L-Histidine-HCL-H<sub>2</sub>O; 106.97 mg/ml of L-Isoleucine; 111.45 mg/ml of L-Leucine; 163.75 mg/ml of L-Lysine HCL; 32.34 mg/ml of L-Methionine; 68.48 mg/ml of L-Phenylalanine; 40.0 mg/ml of L-Proline; 26.25 mg/ml of L-Serine; 101.05 mg/ml of L-Threonine;
- 35

19.22 mg/ml of L-Tryptophan; 91.79 mg/ml of L-Tyrosine-2Na-2H<sub>2</sub>O; and 99.65 mg/ml of L-Valine; 0.0035 mg/L of Biotin; 3.24 mg/L of D-Ca Pantothenate; 11.78 mg/L of Choline Chloride; 4.65 mg/L of Folic Acid; 15.60 mg/L of i-Inositol; 3.02 mg/L of Niacinamide; 3.00 mg/L of Pyridoxal HCL; 0.031 mg/L of Pyridoxine HCL; 0.319 mg/L of Riboflavin; 3.17 mg/L of Thiamine HCL; 0.365 mg/L of Thymidine; 0.680 mg/L of Vitamin B<sub>12</sub>; 25 mM of HEPES Buffer; 2.39 mg/L of Na Hypoxanthine; 0.105 mg/L of Lipoic Acid; 0.081 mg/L of Sodium Putrescine-2HCL; 55.0 mg/L of Sodium Pyruvate; 0.0067 mg/L of Sodium Selenite; 20uM of Ethanolamine; 0.122 mg/L of Ferric Citrate; 41.70 mg/L of Methyl-B-Cyclodextrin complexed with Linoleic Acid; 33.33 mg/L of Methyl-B-Cyclodextrin complexed with Oleic Acid; 10 mg/L of Methyl-B-Cyclodextrin complexed with Retinal Acetate. Adjust osmolarity to 327 mOsm) with 2mM glutamine and 1x penstrep. (BSA (81-068-3 Bayer) 100gm dissolved in 1L DMEM for a 10% BSA stock solution). Filter the media and collect 50 ul for endotoxin assay in 15ml polystyrene conical.

The transfection reaction is terminated, preferably by tag-teaming, at the end of the incubation period. Person A aspirates off the transfection media, while person B adds 1.5ml appropriate media to each well. Incubate at 37 degree C for 45 or 72 hours depending on the media used: 1%BSA for 45 hours or CHO-5 for 72 hours.

On day four, using a 300ul multichannel pipetter, aliquot 600ul in one 1ml deep well plate and the remaining supernatant into a 2ml deep well. The supernatants from each well can then be used in the assays described in Examples 32-39.

It is specifically understood that when activity is obtained in any of the assays described below using a supernatant, the activity originates from either the polypeptide of the present invention directly (e.g., as a secreted protein) or by polypeptide of the present invention inducing expression of other proteins, which are then secreted into the supernatant. Thus, the invention further provides a method of identifying the protein in the supernatant characterized by an activity in a particular assay.

#### ***Example 31: Construction of GAS Reporter Construct***

One signal transduction pathway involved in the differentiation and proliferation of cells is called the Jaks-STATs pathway. Activated proteins in the Jaks-STATs pathway bind to gamma activation site "GAS" elements or interferon-sensitive responsive element ("ISRE"), located in the promoter of many genes. The binding of a protein to these elements alter the expression of the associated gene.

GAS and ISRE elements are recognized by a class of transcription factors called Signal Transducers and Activators of Transcription, or "STATs." There are six members of the STATs family. Stat1 and Stat3 are present in many cell types, as is Stat2 (as response to IFN-



alpha is widespread). Stat4 is more restricted and is not in many cell types though it has been found in T helper class I, cells after treatment with IL-12. Stat5 was originally called mammary growth factor, but has been found at higher concentrations in other cells including myeloid cells. It can be activated in tissue culture cells by many cytokines.

5           The STATs are activated to translocate from the cytoplasm to the nucleus upon tyrosine phosphorylation by a set of kinases known as the Janus Kinase ("Jaks") family. Jaks represent a distinct family of soluble tyrosine kinases and include Tyk2, Jak1, Jak2, and Jak3. These kinases display significant sequence similarity and are generally catalytically inactive in resting cells.

10           The Jaks are activated by a wide range of receptors summarized in the Table below. (Adapted from review by Schidler and Darnell, Ann. Rev. Biochem. 64:621-51 (1995)). A cytokine receptor family, capable of activating Jaks, is divided into two groups: (a) Class 1 includes receptors for IL-2, IL-3, IL-4, IL-6, IL-7, IL-9, IL-11, IL-12, IL-15, Epo, PRL, GH, G-CSF, GM-CSF, LIF, CNTF, and thrombopoietin; and (b) Class 2 includes IFN-a, IFN-g, and IL-  
15 10. The Class 1 receptors share a conserved cysteine motif (a set of four conserved cysteines and one tryptophan) and a WSXWS motif (a membrane proximal region encoding Trp-Ser-Xaa-Trp-Ser (SEQ ID NO: 2)).

          Thus, on binding of a ligand to a receptor, Jaks are activated, which in turn activate STATs, which then translocate and bind to GAS elements. This entire process is encompassed in  
20 the Jaks-STATs signal transduction pathway. Therefore, activation of the Jaks-STATs pathway, reflected by the binding of the GAS or the ISRE element, can be used to indicate proteins involved in the proliferation and differentiation of cells. For example, growth factors and cytokines are known to activate the Jaks-STATs pathway (See Table below). Thus, by using GAS elements linked to reporter molecules, activators of the Jaks-STATs pathway can be identified.

25

	<u>Ligand</u>	<u>tyk2</u>	<u>JAKs</u>			<u>STATS GAS(elements) or ISRE</u>
			<u>Jak1</u>	<u>Jak2</u>	<u>Jak3</u>	
30	<u>IFN family</u>					
	IFN-a/B	+	+	-	-	1,2,3 ISRE
	IFN-g		+	+	-	1 GAS (IRF1>Lys6>IFP)
	IL-10	+	?	?	-	1,3
40	<u>gp130 family</u>					
	IL-6 (Pleiotropic)	+	+	+	?	1,3 GAS (IRF1>Lys6>IFP)
	IL-11(Pleiotropic)	?	+	?	?	1,3
	OnM(Pleiotropic)	?	+	+	?	1,3
	LIF(Pleiotropic)	?	+	+	?	1,3
	CNTF(Pleiotropic)	-/+	+	+	?	1,3
	G-CSF(Pleiotropic)	?	+	?	?	1,3
	IL-12(Pleiotropic)	+	-	+	+	1,3
	<u>g-C family</u>					
	IL-2 (lymphocytes)	-	+	-	+	1,3,5 GAS
50	IL-4 (lymph/myeloid)	-	+	-	+	6 GAS (IRF1 = IFP >>Ly6)(IgH)
	IL-7 (lymphocytes)	-	+	-	+	5 GAS
	IL-9 (lymphocytes)	-	+	-	+	5 GAS
	IL-13 (lymphocyte)	-	+	?	?	6 GAS
	IL-15	?	+	?	+	5 GAS
	<u>gp140 family</u>					
	IL-3 (myeloid)	-	-	+	-	5 GAS (IRF1>IFP>>Ly6)
	IL-5 (myeloid)	-	-	+	-	5 GAS
	GM-CSF (myeloid)	-	-	+	-	5 GAS
	<u>Growth hormone family</u>					
60	GH	?	-	+	-	5
	PRL	?	+/-	+	-	1,3,5
	EPO	?	-	+	-	5 GAS(B-
	CAS>IRF1=IFP>>Ly6)					
	<u>Receptor Tyrosine Kinases</u>					
	EGF	?	+	+	-	1,3 GAS (IRF1)
	PDGF	?	+	+	-	1,3
	CSF-1	?	+	+	-	1,3 GAS (not IRF1)

To construct a synthetic GAS containing promoter element, which is used in the Biological Assays described in Examples 32-33, a PCR based strategy is employed to generate a GAS-SV40 promoter sequence. The 5' primer contains four tandem copies of the GAS binding site found in the IRF1 promoter and previously demonstrated to bind STATs upon induction with a range of cytokines (Rothman et al., *Immunity* 1:457-468 (1994).), although other GAS or ISRE elements can be used instead. The 5' primer also contains 18bp of sequence complementary to the SV40 early promoter sequence and is flanked with an XhoI site. The sequence of the 5' primer is:  
 5':GCGCCTCGAGATTCCCCGAAATCTAGATTCCCCGAAATGATTCCCCGAAATGAT  
 TTCCCCGAAATATCTGCCATCTCAATTAG:3' (SEQ ID NO: 3)

The downstream primer is complementary to the SV40 promoter and is flanked with a Hind III site: 5':GCGGCAAGCTTTTGGCAAAGCCTAGGC:3' (SEQ ID NO: 4)

PCR amplification is performed using the SV40 promoter template present in the B-gal:promoter plasmid obtained from Clontech. The resulting PCR fragment is digested with XhoI/Hind III and subcloned into BLSK2-. (Stratagene.) Sequencing with forward and reverse primers confirms that the insert contains the following sequence:

5':CTCGAGATTCCCCGAAATCTAGATTCCCCGAAATGATTCCCCGAAATGATTCC  
 CCGAAATATCTGCCATCTCAATTAGTCAGCAACCATAGTCCCGCCCCTAACTCCGCCC  
 ATCCCGCCCCTAACTCCGCCCAGTTCCGCCCATTCTCCGCCCCATGGCTGACTAATTTT  
 TTTTATTTATGCAGAGGCCGAGGCCGCTCGGCCTCTGAGCTATTCCAGAAGTAGTGA  
 GGAGGCTTTTTTGGAGGCCTAGGCTTTTGCAAAAGCTT:3' (SEQ ID NO: 5)

With this GAS promoter element linked to the SV40 promoter, a GAS:SEAP2 reporter construct is next engineered. Here, the reporter molecule is a secreted alkaline phosphatase, or "SEAP." Clearly, however, any reporter molecule can be instead of SEAP, in this or in any of the other Examples. Well known reporter molecules that can be used instead of SEAP include chloramphenicol acetyltransferase (CAT), luciferase, alkaline phosphatase, B-galactosidase, green fluorescent protein (GFP), or any protein detectable by an antibody.

The above sequence confirmed synthetic GAS-SV40 promoter element is subcloned into the pSEAP-Promoter vector obtained from Clontech using HindIII and XhoI, effectively replacing the SV40 promoter with the amplified GAS:SV40 promoter element, to create the GAS-SEAP vector. However, this vector does not contain a neomycin resistance gene, and therefore, is not preferred for mammalian expression systems.

Thus, in order to generate mammalian stable cell lines expressing the GAS-SEAP reporter, the GAS-SEAP cassette is removed from the GAS-SEAP vector using SalI and NotI, and inserted into a backbone vector containing the neomycin resistance gene, such as pGFP-1 (Clontech), using these restriction sites in the multiple cloning site, to create the GAS-SEAP/Neo

vector. Once this vector is transfected into mammalian cells, this vector can then be used as a reporter molecule for GAS binding as described in Examples 32-33.

Other constructs can be made using the above description and replacing GAS with a different promoter sequence. For example, construction of reporter molecules containing EGR and NF-KB promoter sequences are described in Examples 34 and 35. However, many other promoters can be substituted using the protocols described in these Examples. For instance, SRE, IL-2, NFAT, or Osteocalcin promoters can be substituted, alone or in combination (e.g., GAS/NF-KB/EGR, GAS/NF-KB, IL-2/NFAT, or NF-KB/GAS). Similarly, other cell lines can be used to test reporter construct activity, such as HELA (epithelial), HUVEC (endothelial), Reh (B-cell), Saos-2 (osteoblast), HUVAC (aortic), or Cardiomyocyte.

***Example 32: High-Throughput Screening Assay for T-cell Activity.***

The following protocol is used to assess T-cell activity by identifying factors, and determining whether supernate containing a polypeptide of the invention proliferates and/or differentiates T-cells. T-cell activity is assessed using the GAS/SEAP/Neo construct produced in Example 31. Thus, factors that increase SEAP activity indicate the ability to activate the Jaks-STATS signal transduction pathway. The T-cell used in this assay is Jurkat T-cells (ATCC Accession No. TIB-152), although Molt-3 cells (ATCC Accession No. CRL-1552) and Molt-4 cells (ATCC Accession No. CRL-1582) cells can also be used.

Jurkat T-cells are lymphoblastic CD4+ Th1 helper cells. In order to generate stable cell lines, approximately 2 million Jurkat cells are transfected with the GAS-SEAP/neo vector using DMRIE-C (Life Technologies)(transfection procedure described below). The transfected cells are seeded to a density of approximately 20,000 cells per well and transfectants resistant to 1 mg/ml gentamicin selected. Resistant colonies are expanded and then tested for their response to increasing concentrations of interferon gamma. The dose response of a selected clone is demonstrated.

Specifically, the following protocol will yield sufficient cells for 75 wells containing 200 ul of cells. Thus, it is either scaled up, or performed in multiple to generate sufficient cells for multiple 96 well plates. Jurkat cells are maintained in RPMI + 10% serum with 1%Pen-Strep. Combine 2.5 mls of OPTI-MEM (Life Technologies) with 10 ug of plasmid DNA in a T25 flask. Add 2.5 ml OPTI-MEM containing 50 ul of DMRIE-C and incubate at room temperature for 15-45 mins.

During the incubation period, count cell concentration, spin down the required number of cells ( $10^7$  per transfection), and resuspend in OPTI-MEM to a final concentration of  $10^7$  cells/ml. Then add 1ml of  $1 \times 10^7$  cells in OPTI-MEM to T25 flask and incubate at 37 degree C for 6 hrs. After the incubation, add 10 ml of RPMI + 15% serum.

The Jurkat:GAS-SEAP stable reporter lines are maintained in RPMI + 10% serum, 1 mg/ml Genticin, and 1% Pen-Strep. These cells are treated with supernatants containing polypeptide of the present invention or polypeptide of the present invention induced polypeptides as produced by the protocol described in Example 30.

5           On the day of treatment with the supernatant, the cells should be washed and resuspended in fresh RPMI + 10% serum to a density of 500,000 cells per ml. The exact number of cells required will depend on the number of supernatants being screened. For one 96 well plate, approximately 10 million cells (for 10 plates, 100 million cells) are required.

10           Transfer the cells to a triangular reservoir boat, in order to dispense the cells into a 96 well dish, using a 12 channel pipette. Using a 12 channel pipette, transfer 200 ul of cells into each well (therefore adding 100,000 cells per well).

15           After all the plates have been seeded, 50 ul of the supernatants are transferred directly from the 96 well plate containing the supernatants into each well using a 12 channel pipette. In addition, a dose of exogenous interferon gamma (0.1, 1.0, 10 ng) is added to wells H9, H10, and H11 to serve as additional positive controls for the assay.

20           The 96 well dishes containing Jurkat cells treated with supernatants are placed in an incubator for 48 hrs (note: this time is variable between 48-72 hrs). 35 ul samples from each well are then transferred to an opaque 96 well plate using a 12 channel pipette. The opaque plates should be covered (using sellophene covers) and stored at -20 degree C until SEAP assays are performed according to Example 36. The plates containing the remaining treated cells are placed at 4 degree C and serve as a source of material for repeating the assay on a specific well if desired.

As a positive control, 100 Unit/ml interferon gamma can be used which is known to activate Jurkat T cells. Over 30 fold induction is typically observed in the positive control wells.

25           The above protocol may be used in the generation of both transient, as well as, stable transfected cells, which would be apparent to those of skill in the art.

#### ***Example 33: High-Throughput Screening Assay Identifying Myeloid Activity***

30           The following protocol is used to assess myeloid activity of polypeptide of the present invention by determining whether polypeptide of the present invention proliferates and/or differentiates myeloid cells. Myeloid cell activity is assessed using the GAS/SEAP/Neo construct produced in Example 31. Thus, factors that increase SEAP activity indicate the ability to activate the Jaks-STATS signal transduction pathway. The myeloid cell used in this assay is U937, a pre-monocyte cell line, although TF-1, HL60, or KG1 can be used.

35           To transiently transfect U937 cells with the GAS/SEAP/Neo construct produced in Example 31, a DEAE-Dextran method (Kharbanda et. al., 1994, Cell Growth & Differentiation, 5:259-265) is used. First, harvest  $2 \times 10^7$  U937 cells and wash with PBS. The U937 cells are

usually grown in RPMI 1640 medium containing 10% heat-inactivated fetal bovine serum (FBS) supplemented with 100 units/ml penicillin and 100 mg/ml streptomycin.

Next, suspend the cells in 1 ml of 20 mM Tris-HCl (pH 7.4) buffer containing 0.5 mg/ml DEAE-Dextran, 8 ug GAS-SEAP2 plasmid DNA, 140 mM NaCl, 5 mM KCl, 375 uM Na<sub>2</sub>HPO<sub>4</sub>·7H<sub>2</sub>O, 1 mM MgCl<sub>2</sub>, and 675 uM CaCl<sub>2</sub>. Incubate at 37 degrees C for 45 min.

Wash the cells with RPMI 1640 medium containing 10% FBS and then resuspend in 10 ml complete medium and incubate at 37 degree C for 36 hr.

The GAS-SEAP/U937 stable cells are obtained by growing the cells in 400 ug/ml G418. The G418-free medium is used for routine growth but every one to two months, the cells should be re-grown in 400 ug/ml G418 for couple of passages.

These cells are tested by harvesting  $1 \times 10^8$  cells (this is enough for ten 96-well plates assay) and wash with PBS. Suspend the cells in 200 ml above described growth medium, with a final density of  $5 \times 10^5$  cells/ml. Plate 200 ul cells per well in the 96-well plate (or  $1 \times 10^5$  cells/well).

Add 50 ul of the supernatant prepared by the protocol described in Example 30. Incubate at 37 degree C for 48 to 72 hr. As a positive control, 100 Unit/ml interferon gamma can be used which is known to activate U937 cells. Over 30 fold induction is typically observed in the positive control wells. SEAP assay the supernatant according to the protocol described in Example 36.

#### ***Example 34: High-Throughput Screening Assay Identifying Neuronal Activity.***

When cells undergo differentiation and proliferation, a group of genes are activated through many different signal transduction pathways. One of these genes, EGR1 (early growth response gene 1), is induced in various tissues and cell types upon activation. The promoter of EGR1 is responsible for such induction. Using the EGR1 promoter linked to reporter molecules, activation of cells can be assessed by polypeptide of the present invention.

Particularly, the following protocol is used to assess neuronal activity in PC12 cell lines. PC12 cells (rat pheochromocytoma cells) are known to proliferate and/or differentiate by activation with a number of mitogens, such as TPA (tetradecanoyl phorbol acetate), NGF (nerve growth factor), and EGF (epidermal growth factor). The EGR1 gene expression is activated during this treatment. Thus, by stably transfecting PC12 cells with a construct containing an EGR promoter linked to SEAP reporter, activation of PC12 cells by polypeptide of the present invention can be assessed.

The EGR/SEAP reporter construct can be assembled by the following protocol. The EGR-1 promoter sequence (-633 to +1)(Sakamoto K et al., Oncogene 6:867-871 (1991)) can be PCR amplified from human genomic DNA using the following primers:

5' GCGCTCGAGGGATGACAGCGATAGAACCCCGG-3' (SEQ ID NO: 6)

5' GCGAAGCTTCGCGACTCCCGGATCCGCCTC-3' (SEQ ID NO: 7)

Using the GAS:SEAP/Neo vector produced in Example 31, EGR1 amplified product can then be inserted into this vector. Linearize the GAS:SEAP/Neo vector using restriction enzymes XhoI/HindIII, removing the GAS/SV40 stuffer. Restrict the EGR1 amplified product with these same enzymes. Ligate the vector and the EGR1 promoter.

To prepare 96 well-plates for cell culture, two mls of a coating solution (1:30 dilution of collagen type I (Upstate Biotech Inc. Cat#08-115) in 30% ethanol (filter sterilized)) is added per one 10 cm plate or 50 ml per well of the 96-well plate, and allowed to air dry for 2 hr.

PC12 cells are routinely grown in RPMI-1640 medium (Bio Whittaker) containing 10% horse serum (JRH BIOSCIENCES, Cat. # 12449-78P), 5% heat-inactivated fetal bovine serum (FBS) supplemented with 100 units/ml penicillin and 100 ug/ml streptomycin on a precoated 10 cm tissue culture dish. One to four split is done every three to four days. Cells are removed from the plates by scraping and resuspended with pipetting up and down for more than 15 times.

Transfect the EGR/SEAP/Neo construct into PC12 using the Lipofectamine protocol described in Example 30. EGR-SEAP/PC12 stable cells are obtained by growing the cells in 300 ug/ml G418. The G418-free medium is used for routine growth but every one to two months, the cells should be re-grown in 300 ug/ml G418 for couple of passages.

To assay for neuronal activity, a 10 cm plate with cells around 70 to 80% confluent is screened by removing the old medium. Wash the cells once with PBS (Phosphate buffered saline). Then starve the cells in low serum medium (RPMI-1640 containing 1% horse serum and 0.5% FBS with antibiotics) overnight.

The next morning, remove the medium and wash the cells with PBS. Scrape off the cells from the plate, suspend the cells well in 2 ml low serum medium. Count the cell number and add more low serum medium to reach final cell density as  $5 \times 10^5$  cells/ml.

Add 200 ul of the cell suspension to each well of 96-well plate (equivalent to  $1 \times 10^5$  cells/well). Add 50 ul supernatant produced by Example 30, 37 degree C for 48 to 72 hr. As a positive control, a growth factor known to activate PC12 cells through EGR can be used, such as 50 ng/ul of Neuronal Growth Factor (NGF). Over fifty-fold induction of SEAP is typically seen in the positive control wells. SEAP assay the supernatant according to Example 36.

#### **Example 35: High-Throughput Screening Assay for T-cell Activity**

NF-KB (Nuclear Factor KB) is a transcription factor activated by a wide variety of agents including the inflammatory cytokines IL-1 and TNF, CD30 and CD40, lymphotoxin-alpha and lymphotoxin-beta, by exposure to LPS or thrombin, and by expression of certain viral gene

products. As a transcription factor, NF- $\kappa$ B regulates the expression of genes involved in immune cell activation, control of apoptosis (NF- $\kappa$ B appears to shield cells from apoptosis), B and T-cell development, anti-viral and antimicrobial responses, and multiple stress responses.

In non-stimulated conditions, NF- $\kappa$ B is retained in the cytoplasm with I- $\kappa$ B (Inhibitor  $\kappa$ B). However, upon stimulation, I- $\kappa$ B is phosphorylated and degraded, causing NF- $\kappa$ B to shuttle to the nucleus, thereby activating transcription of target genes. Target genes activated by NF- $\kappa$ B include IL-2, IL-6, GM-CSF, ICAM-1 and class I MHC.

Due to its central role and ability to respond to a range of stimuli, reporter constructs utilizing the NF- $\kappa$ B promoter element are used to screen the supernatants produced in Example 30. Activators or inhibitors of NF- $\kappa$ B would be useful in detecting, preventing, diagnosing, prognosticating, treating, and/or ameliorating diseases. For example, inhibitors of NF- $\kappa$ B could be used to treat those diseases related to the acute or chronic activation of NF- $\kappa$ B, such as rheumatoid arthritis.

To construct a vector containing the NF- $\kappa$ B promoter element, a PCR based strategy is employed. The upstream primer contains four tandem copies of the NF- $\kappa$ B binding site (GGGGACTTTCCC) (SEQ ID NO: 8), 18 bp of sequence complementary to the 5' end of the SV40 early promoter sequence, and is flanked with an XhoI site:

5':GCGGCCTCGAGGGGACTTTCCCGGGGACTTTCCGGGACTTTCCGGGACTTTCCATCCTGCCATCTCAATTAG:3' (SEQ ID NO: 9)

The downstream primer is complementary to the 3' end of the SV40 promoter and is flanked with a Hind III site:

5':GCGGCAAGCTTTTTGCAAAGCCTAGGC:3' (SEQ ID NO: 4)

PCR amplification is performed using the SV40 promoter template present in the pB-gal:promoter plasmid obtained from Clontech. The resulting PCR fragment is digested with XhoI and Hind III and subcloned into BLSK2-. (Stratagene) Sequencing with the T7 and T3 primers confirms the insert contains the following sequence:

5':CTCGAGGGGACTTTCCCGGGGACTTTCCGGGACTTTCCGGGACTTTCCATCTGCCA  
TCTCAATTAGTCAGCAACCATAGTCCCGCCCCTAACTCCGCCCATCCCGCCCCTAACTC  
CGCCCAGTTCGCCCATTCTCGCCCCATGGCTGACTAATTTTTTTTATTTATGCAGAG  
GCCGAGGCCGCTCGGCCTCTGAGCTATTCCAGAAGTAGTGAGGAGGCTTTTTTGGAG  
GCCTAGGCTTTTGCAAAAAGCTT:3' (SEQ ID NO: 10)

Next, replace the SV40 minimal promoter element present in the pSEAP2-promoter plasmid (Clontech) with this NF- $\kappa$ B/SV40 fragment using XhoI and HindIII. However, this vector does not contain a neomycin resistance gene, and therefore, is not preferred for mammalian expression systems.



In order to generate stable mammalian cell lines, the NF-KB/SV40/SEAP cassette is removed from the above NF-KB/SEAP vector using restriction enzymes SalI and NotI, and inserted into a vector containing neomycin resistance. Particularly, the NF-KB/SV40/SEAP cassette was inserted into pGFP-1 (Clontech), replacing the GFP gene, after restricting pGFP-1 with SalI and NotI.

Once NF-KB/SV40/SEAP/Neo vector is created, stable Jurkat T-cells are created and maintained according to the protocol described in Example 32. Similarly, the method for assaying supernatants with these stable Jurkat T-cells is also described in Example 32. As a positive control, exogenous TNF alpha (0.1, 1, 10 ng) is added to wells H9, H10, and H11, with a 5-10 fold activation typically observed.

#### *Example 36: Assay for SEAP Activity*

As a reporter molecule for the assays described in Examples 32-35, SEAP activity is assayed using the Tropix Phospho-light Kit (Cat. BP-400) according to the following general procedure. The Tropix Phospho-light Kit supplies the Dilution, Assay, and Reaction Buffers used below.

Prime a dispenser with the 2.5x Dilution Buffer and dispense 15 ul of 2.5x dilution buffer into Optiplates containing 35 ul of a supernatant. Seal the plates with a plastic sealer and incubate at 65 degree C for 30 min. Separate the Optiplates to avoid uneven heating.

Cool the samples to room temperature for 15 minutes. Empty the dispenser and prime with the Assay Buffer. Add 50 ml Assay Buffer and incubate at room temperature 5 min. Empty the dispenser and prime with the Reaction Buffer (see the Table below). Add 50 ul Reaction Buffer and incubate at room temperature for 20 minutes. Since the intensity of the chemiluminescent signal is time dependent, and it takes about 10 minutes to read 5 plates on a luminometer, thus one should treat 5 plates at each time and start the second set 10 minutes later.

Read the relative light unit in the luminometer. Set H12 as blank, and print the results. An increase in chemiluminescence indicates reporter activity.

Reaction Buffer Formulation:

# of plates	Rxn buffer diluent (ml)	CSPD (ml)
10	60	3
11	65	3.25
12	70	3.5
13	75	3.75
14	80	4
15	85	4.25
16	90	4.5
17	95	4.75
18	100	5
19	105	5.25

20	110	5.5
21	115	5.75
22	120	6
23	125	6.25
24	130	6.5
25	135	6.75
26	140	7
27	145	7.25
28	150	7.5
29	155	7.75
30	160	8
31	165	8.25
32	170	8.5
33	175	8.75
34	180	9
35	185	9.25
36	190	9.5
37	195	9.75
38	200	10
39	205	10.25
40	210	10.5
41	215	10.75
42	220	11
43	225	11.25
44	230	11.5
45	235	11.75
46	240	12
47	245	12.25
48	250	12.5
49	255	12.75
50	260	13

**Example 37: High-Throughput Screening Assay Identifying Changes in Small Molecule Concentration and Membrane Permeability**

5 Binding of a ligand to a receptor is known to alter intracellular levels of small molecules, such as calcium, potassium, sodium, and pH, as well as alter membrane potential. These alterations can be measured in an assay to identify supernatants which bind to receptors of a particular cell. Although the following protocol describes an assay for calcium, this protocol can easily be modified to detect changes in potassium, sodium, pH, membrane potential, or any other

10 small molecule which is detectable by a fluorescent probe.

The following assay uses Fluorometric Imaging Plate Reader ("FLIPR") to measure changes in fluorescent molecules (Molecular Probes) that bind small molecules. Clearly, any fluorescent molecule detecting a small molecule can be used instead of the calcium fluorescent molecule, fluo-4 (Molecular Probes, Inc.; catalog no. F-14202), used here.

15 For adherent cells, seed the cells at 10,000 -20,000 cells/well in a Co-star black 96-well plate with clear bottom. The plate is incubated in a CO<sub>2</sub> incubator for 20 hours. The adherent

cells are washed two times in Biotek washer with 200 ul of HBSS (Hank's Balanced Salt Solution) leaving 100 ul of buffer after the final wash.

A stock solution of 1 mg/ml fluo-4 is made in 10% pluronic acid DMSO. To load the cells with fluo-4, 50 ul of 12 ug/ml fluo-4 is added to each well. The plate is incubated at 37 degrees C in a CO<sub>2</sub> incubator for 60 min. The plate is washed four times in the Biotek washer with HBSS leaving 100 ul of buffer.

For non-adherent cells, the cells are spun down from culture media. Cells are re-suspended to 2-5x10<sup>6</sup> cells/ml with HBSS in a 50-ml conical tube. 4 ul of 1 mg/ml fluo-4 solution in 10% pluronic acid DMSO is added to each ml of cell suspension. The tube is then placed in a 37 degrees C water bath for 30-60 min. The cells are washed twice with HBSS, resuspended to 1x10<sup>6</sup> cells/ml, and dispensed into a microplate, 100 ul/well. The plate is centrifuged at 1000 rpm for 5 min. The plate is then washed once in Denley Cell Wash with 200 ul, followed by an aspiration step to 100 ul final volume.

For a non-cell based assay, each well contains a fluorescent molecule, such as fluo-4. The supernatant is added to the well, and a change in fluorescence is detected.

To measure the fluorescence of intracellular calcium, the FLIPR is set for the following parameters: (1) System gain is 300-800 mW; (2) Exposure time is 0.4 second; (3) Camera F/stop is F/2; (4) Excitation is 488 nm; (5) Emission is 530 nm; and (6) Sample addition is 50 ul. Increased emission at 530 nm indicates an extracellular signaling event caused by the molecule, either polypeptide of the present invention or a molecule induced by polypeptide of the present invention, which has resulted in an increase in the intracellular Ca<sup>++</sup> concentration.

***Example 38: High-Throughput Screening Assay Identifying Tyrosine Kinase Activity***

The Protein Tyrosine Kinases (PTK) represent a diverse group of transmembrane and cytoplasmic kinases. Within the Receptor Protein Tyrosine Kinase (RPTK) group are receptors for a range of mitogenic and metabolic growth factors including the PDGF, FGF, EGF, NGF, HGF and Insulin receptor subfamilies. In addition there are a large family of RPTKs for which the corresponding ligand is unknown. Ligands for RPTKs include mainly secreted small proteins, but also membrane-bound and extracellular matrix proteins.

Activation of RPTK by ligands involves ligand-mediated receptor dimerization, resulting in transphosphorylation of the receptor subunits and activation of the cytoplasmic tyrosine kinases. The cytoplasmic tyrosine kinases include receptor associated tyrosine kinases of the src-family (e.g., src, yes, lck, lyn, fyn) and non-receptor linked and cytosolic protein tyrosine kinases, such as the Jak family, members of which mediate signal transduction triggered by the cytokine superfamily of receptors (e.g., the Interleukins, Interferons, GM-CSF, and Leptin).

Because of the wide range of known factors capable of stimulating tyrosine kinase activity, identifying whether polypeptide of the present invention or a molecule induced by polypeptide of the present invention is capable of activating tyrosine kinase signal transduction pathways is of interest. Therefore, the following protocol is designed to identify such molecules capable of activating the tyrosine kinase signal transduction pathways.

Seed target cells (e.g., primary keratinocytes) at a density of approximately 25,000 cells per well in a 96 well Loprodyne Silent Screen Plates purchased from Nalge Nunc (Naperville, IL). The plates are sterilized with two 30 minute rinses with 100% ethanol, rinsed with water and dried overnight. Some plates are coated for 2 hr with 100 ml of cell culture grade type I collagen (50 mg/ml), gelatin (2%) or polylysine (50 mg/ml), all of which can be purchased from Sigma Chemicals (St. Louis, MO) or 10% Matrigel purchased from Becton Dickinson (Bedford, MA), or calf serum, rinsed with PBS and stored at 4 degree C. Cell growth on these plates is assayed by seeding 5,000 cells/well in growth medium and indirect quantitation of cell number through use of alamarBlue as described by the manufacturer Alamar Biosciences, Inc. (Sacramento, CA) after 48 hr. Falcon plate covers #3071 from Becton Dickinson (Bedford, MA) are used to cover the Loprodyne Silent Screen Plates. Falcon Microtest III cell culture plates can also be used in some proliferation experiments.

To prepare extracts, A431 cells are seeded onto the nylon membranes of Loprodyne plates (20,000/200ml/well) and cultured overnight in complete medium. Cells are quiesced by incubation in serum-free basal medium for 24 hr. After 5-20 minutes treatment with EGF (60ng/ml) or 50 ul of the supernatant produced in Example 30, the medium was removed and 100 ml of extraction buffer ((20 mM HEPES pH 7.5, 0.15 M NaCl, 1% Triton X-100, 0.1% SDS, 2 mM Na3VO4, 2 mM Na4P2O7 and a cocktail of protease inhibitors (# 1836170) obtained from Boehringer Mannheim (Indianapolis, IN)) is added to each well and the plate is shaken on a rotating shaker for 5 minutes at 4°C. The plate is then placed in a vacuum transfer manifold and the extract filtered through the 0.45 mm membrane bottoms of each well using house vacuum. Extracts are collected in a 96-well catch/assay plate in the bottom of the vacuum manifold and immediately placed on ice. To obtain extracts clarified by centrifugation, the content of each well, after detergent solubilization for 5 minutes, is removed and centrifuged for 15 minutes at 4 degree C at 16,000 x g.

Test the filtered extracts for levels of tyrosine kinase activity. Although many methods of detecting tyrosine kinase activity are known, one method is described here.

Generally, the tyrosine kinase activity of a supernatant is evaluated by determining its ability to phosphorylate a tyrosine residue on a specific substrate (a biotinylated peptide). Biotinylated peptides that can be used for this purpose include PSK1 (corresponding to amino acids 6-20 of the cell division kinase cdc2-p34) and PSK2 (corresponding to amino acids 1-17 of

gastrin). Both peptides are substrates for a range of tyrosine kinases and are available from Boehringer Mannheim.

The tyrosine kinase reaction is set up by adding the following components in order. First, add 10ul of 5uM Biotinylated Peptide, then 10ul ATP/Mg<sub>2+</sub> (5mM ATP/50mM MgCl<sub>2</sub>), then 10ul of 5x Assay Buffer (40mM imidazole hydrochloride, pH7.3, 40 mM beta-glycerophosphate, 1mM EGTA, 100mM MgCl<sub>2</sub>, 5 mM MnCl<sub>2</sub>, 0.5 mg/ml BSA), then 5ul of Sodium Vanadate (1mM), and then 5ul of water. Mix the components gently and preincubate the reaction mix at 30 degree C for 2 min. Initial the reaction by adding 10ul of the control enzyme or the filtered supernatant.

10 The tyrosine kinase assay reaction is then terminated by adding 10 ul of 120mM EDTA and place the reactions on ice.

Tyrosine kinase activity is determined by transferring 50 ul aliquot of reaction mixture to a microtiter plate (MTP) module and incubating at 37 degree C for 20 min. This allows the streptavidin coated 96 well plate to associate with the biotinylated peptide. Wash the MTP module with 300ul/well of PBS four times. Next add 75 ul of anti-phosphotyrosine antibody conjugated to horse radish peroxidase (anti-P-Tyr-POD(0.5u/ml)) to each well and incubate at 37 degree C for one hour. Wash the well as above.

20 Next add 100ul of peroxidase substrate solution (Boehringer Mannheim) and incubate at room temperature for at least 5 mins (up to 30 min). Measure the absorbance of the sample at 405 nm by using ELISA reader. The level of bound peroxidase activity is quantitated using an ELISA reader and reflects the level of tyrosine kinase activity.

#### ***Example 39: High-Throughput Screening Assay Identifying Phosphorylation Activity***

25 As a potential alternative and/or complement to the assay of protein tyrosine kinase activity described in Example 38, an assay which detects activation (phosphorylation) of major intracellular signal transduction intermediates can also be used. For example, as described below one particular assay can detect tyrosine phosphorylation of the Erk-1 and Erk-2 kinases. However, phosphorylation of other molecules, such as Raf, JNK, p38 MAP, Map kinase kinase (MEK), MEK kinase, Src, Muscle specific kinase (MuSK), IRAK, Tec, and Janus, as well as any other phosphoserine, phosphotyrosine, or phosphothreonine molecule, can be detected by substituting these molecules for Erk-1 or Erk-2 in the following assay.

35 Specifically, assay plates are made by coating the wells of a 96-well ELISA plate with 0.1ml of protein G (1ug/ml) for 2 hr at room temp, (RT). The plates are then rinsed with PBS and blocked with 3% BSA/PBS for 1 hr at RT. The protein G plates are then treated with 2 commercial monoclonal antibodies (100ng/well) against Erk-1 and Erk-2 (1 hr at RT) (Santa Cruz Biotechnology). (To detect other molecules, this step can easily be modified by substituting a

monoclonal antibody detecting any of the above described molecules.) After 3-5 rinses with PBS, the plates are stored at 4 degree C until use.

A431 cells are seeded at 20,000/well in a 96-well Loprodyn filterplate and cultured overnight in growth medium. The cells are then starved for 48 hr in basal medium (DMEM) and then treated with EGF (6ng/well) or 50 ul of the supernatants obtained in Example 30 for 5-20 minutes. The cells are then solubilized and extracts filtered directly into the assay plate.

After incubation with the extract for 1 hr at RT, the wells are again rinsed. As a positive control, a commercial preparation of MAP kinase (10ng/well) is used in place of A431 extract. Plates are then treated with a commercial polyclonal (rabbit) antibody (1ug/ml) which specifically recognizes the phosphorylated epitope of the Erk-1 and Erk-2 kinases (1 hr at RT). This antibody is biotinylated by standard procedures. The bound polyclonal antibody is then quantitated by successive incubations with Europium-streptavidin and Europium fluorescence enhancing reagent in the Wallac DELFIA instrument (time-resolved fluorescence). An increased fluorescent signal over background indicates a phosphorylation by polypeptide of the present invention or a molecule induced by polypeptide of the present invention.

#### ***Example 40: Assay for the Stimulation of Bone Marrow CD34+ Cell Proliferation***

This assay is based on the ability of human CD34+ to proliferate in the presence of hematopoietic growth factors and evaluates the ability of isolated polypeptides expressed in mammalian cells to stimulate proliferation of CD34+ cells.

It has been previously shown that most mature precursors will respond to only a single signal. More immature precursors require at least two signals to respond. Therefore, to test the effect of polypeptides on hematopoietic activity of a wide range of progenitor cells, the assay contains a given polypeptide in the presence or absence of other hematopoietic growth factors. Isolated cells are cultured for 5 days in the presence of Stem Cell Factor (SCF) in combination with tested sample. SCF alone has a very limited effect on the proliferation of bone marrow (BM) cells, acting in such conditions only as a "survival" factor. However, combined with any factor exhibiting stimulatory effect on these cells (e.g., IL-3), SCF will cause a synergistic effect. Therefore, if the tested polypeptide has a stimulatory effect on hematopoietic progenitors, such activity can be easily detected. Since normal BM cells have a low level of cycling cells, it is likely that any inhibitory effect of a given polypeptide, or agonists or antagonists thereof, might not be detected. Accordingly, assays for an inhibitory effect on progenitors is preferably tested in cells that are first subjected to *in vitro* stimulation with SCF+IL+3, and then contacted with the compound that is being evaluated for inhibition of such induced proliferation.

Briefly, CD34+ cells are isolated using methods known in the art. The cells are thawed and resuspended in medium (QBSF 60 serum-free medium with 1% L-glutamine (500ml)

Quality Biological, Inc., Gaithersburg, MD Cat# 160-204-101). After several gentle centrifugation steps at 200 x g, cells are allowed to rest for one hour. The cell count is adjusted to  $2.5 \times 10^5$  cells/ml. During this time, 100  $\mu$ l of sterile water is added to the peripheral wells of a 96-well plate. The cytokines that can be tested with a given polypeptide in this assay is rhSCF (R&D Systems, Minneapolis, MN, Cat# 255-SC) at 50 ng/ml alone and in combination with rhSCF and rhIL-3 (R&D Systems, Minneapolis, MN, Cat# 203-ML) at 30 ng/ml. After one hour, 10  $\mu$ l of prepared cytokines, 50  $\mu$ l of the supernatants prepared in Example 30 (supernatants at 1:2 dilution = 50  $\mu$ l) and 20  $\mu$ l of diluted cells are added to the media which is already present in the wells to allow for a final total volume of 100  $\mu$ l. The plates are then placed in a 37°C/5% CO<sub>2</sub> incubator for five days.

Eighteen hours before the assay is harvested, 0.5  $\mu$ Ci/well of [3H] Thymidine is added in a 10  $\mu$ l volume to each well to determine the proliferation rate. The experiment is terminated by harvesting the cells from each 96-well plate to a filtermat using the Tomtec Harvester 96. After harvesting, the filtermats are dried, trimmed and placed into OmniFilter assemblies consisting of one OmniFilter plate and one OmniFilter Tray. 60  $\mu$ l Microscint is added to each well and the plate sealed with TopSeal-A press-on sealing film. A bar code 15 sticker is affixed to the first plate for counting. The sealed plates are then loaded and the level of radioactivity determined via the Packard Top Count and the printed data collected for analysis. The level of radioactivity reflects the amount of cell proliferation.

The studies described in this example test the activity of a given polypeptide to stimulate bone marrow CD34+ cell proliferation. One skilled in the art could easily modify the exemplified studies to test the activity of polynucleotides (e.g., gene therapy), antibodies, agonists, and/or antagonists and fragments and variants thereof. As a nonlimiting example, potential antagonists tested in this assay would be expected to inhibit cell proliferation in the presence of cytokines and/or to increase the inhibition of cell proliferation in the presence of cytokines and a given polypeptide. In contrast, potential agonists tested in this assay would be expected to enhance cell proliferation and/or to decrease the inhibition of cell proliferation in the presence of cytokines and a given polypeptide.

The ability of a gene to stimulate the proliferation of bone marrow CD34+ cells indicates that polynucleotides and polypeptides corresponding to the gene are useful for the detection, prevention, diagnosis, prognostication, treatment, and/or amelioration of disorders affecting the immune system and hematopoiesis. Representative uses are described in the "Immune Activity" and "Infectious Disease" sections above, and elsewhere herein.

**Example 41: Assay for Extracellular Matrix Enhanced Cell Response (EMEER)**

The objective of the Extracellular Matrix Enhanced Cell Response (EMECR) assay is to identify gene products (e.g., isolated polypeptides) that act on the hematopoietic stem cells in the context of the extracellular matrix (ECM) induced signal.

Cells respond to the regulatory factors in the context of signal(s) received from the surrounding microenvironment. For example, fibroblasts, and endothelial and epithelial stem cells fail to replicate in the absence of signals from the ECM. Hematopoietic stem cells can undergo self-renewal in the bone marrow, but not in *in vitro* suspension culture. The ability of stem cells to undergo self-renewal *in vitro* is dependent upon their interaction with the stromal cells and the ECM protein fibronectin (fn). Adhesion of cells to fn is mediated by the  $\alpha_5\beta_1$  and  $\alpha_4\beta_1$  integrin receptors, which are expressed by human and mouse hematopoietic stem cells. The factor(s) which integrate with the ECM environment and are responsible for stimulating stem cell self-renewal have not yet been identified. Discovery of such factors should be of great interest in gene therapy and bone marrow transplant applications

Briefly, polystyrene, non tissue culture treated, 96-well plates are coated with fn fragment at a coating concentration of  $0.2 \mu\text{g}/\text{cm}^2$ . Mouse bone marrow cells are plated (1,000 cells/well) in 0.2 ml of serum-free medium. Cells cultured in the presence of IL-3 (5 ng/ml) + SCF (50 ng/ml) would serve as the positive control, conditions under which little self-renewal but pronounced differentiation of the stem cells is to be expected. Gene products of the invention (e.g., including, but not limited to, polynucleotides and polypeptides of the present invention, and supernatants produced in Example 30), are tested with appropriate negative controls in the presence and absence of SCF (5.0 ng/ml), where test factor supernatants represent 10% of the total assay volume. The plated cells are then allowed to grow by incubating in a low oxygen environment (5%  $\text{CO}_2$ , 7%  $\text{O}_2$ , and 88%  $\text{N}_2$ ) tissue culture incubator for 7 days. The number of proliferating cells within the wells is then quantitated by measuring thymidine incorporation into cellular DNA. Verification of the positive hits in the assay will require phenotypic characterization of the cells, which can be accomplished by scaling up of the culture system and using appropriate antibody reagents against cell surface antigens and FACSscan.

One skilled in the art could easily modify the exemplified studies to test the activity of polynucleotides (e.g., gene therapy), antibodies, agonists, and/or antagonists and fragments and variants thereof.

If a particular polypeptide of the present invention is found to be a stimulator of hematopoietic progenitors, polynucleotides and polypeptides corresponding to the gene encoding said polypeptide may be useful for the detection, prevention, diagnosis, prognostication, treatment, and/or amelioration of disorders affecting the immune system and hematopoiesis. Representative uses are described in the "Immune Activity" and "Infectious Disease" sections above, and elsewhere herein. The gene product may also be useful in the expansion of stem cells and



committed progenitors of various blood lineages, and in the differentiation and/or proliferation of various cell types.

5 Additionally, the polynucleotides and/or polypeptides of the gene of interest and/or agonists and/or antagonists thereof, may also be employed to inhibit the proliferation and differentiation of hematopoietic cells and therefore may be employed to protect bone marrow stem cells from chemotherapeutic agents during chemotherapy. This antiproliferative effect may allow administration of higher doses of chemotherapeutic agents and, therefore, more effective chemotherapeutic treatment.

10 Moreover, polynucleotides and polypeptides corresponding to the gene of interest may also be useful for the detection, prevention, diagnosis, prognostication, treat, and/or amelioration of hematopoietic related disorders such as, for example, anemia, pancytopenia, leukopenia, thrombocytopenia or leukemia since stromal cells are important in the production of cells of hematopoietic lineages. The uses include bone marrow cell ex-vivo culture, bone marrow transplantation, bone marrow reconstitution, radiotherapy or chemotherapy of neoplasia.

15

***Example 42: Human Dermal Fibroblast and Aortic Smooth Muscle Cell Proliferation***

The polypeptide of interest is added to cultures of normal human dermal fibroblasts (NHDF) and human aortic smooth muscle cells (AoSMC) and two co-assays are performed with each sample. The first assay examines the effect of the polypeptide of interest on the proliferation of normal human dermal fibroblasts (NHDF) or aortic smooth muscle cells (AoSMC). Aberrant growth of fibroblasts or smooth muscle cells is a part of several pathological processes, including fibrosis, and restenosis. The second assay examines IL6 production by both NHDF and SMC. IL6 production is an indication of functional activation. Activated cells will have increased production of a number of cytokines and other factors, which can result in a proinflammatory or immunomodulatory outcome. Assays are run with and without co-TNF $\alpha$  stimulation, in order to check for costimulatory or inhibitory activity.

20 Briefly, on day 1, 96-well black plates are set up with 1000 cells/well (NHDF) or 2000 cells/well (AoSMC) in 100  $\mu$ l culture media. NHDF culture media contains: Clonetics FB basal media, 1mg/ml hFGF, 5mg/ml insulin, 50mg/ml gentamycin, 2%FBS, while AoSMC culture media contains Clonetics SM basal media, 0.5  $\mu$ g/ml hEGF, 5mg/ml insulin, 1 $\mu$ g/ml hFGF, 50mg/ml gentamycin, 50  $\mu$ g/ml Amphotericin B, 5%FBS. After incubation at 37°C for at least 4-5 hours culture media is aspirated and replaced with growth arrest media. Growth arrest media for NHDF contains fibroblast basal media, 50mg/ml gentamycin, 2% FBS, while growth arrest media for AoSMC contains SM basal media, 50mg/ml gentamycin, 50 $\mu$ g/ml Amphotericin B, 0.4% FBS.

35 Incubate at 37 °C until day 2.

On day 2, serial dilutions and templates of the polypeptide of interest are designed such that they always include media controls and known-protein controls. For both stimulation and inhibition experiments, proteins are diluted in growth arrest media. For inhibition experiments, TNF $\alpha$  is added to a final concentration of 2ng/ml (NHDF) or 5ng/ml (AoSMC). Add  
5 1/3 vol media containing controls or polypeptides of the present invention and incubate at 37 degrees C/5% CO<sub>2</sub> until day 5.

- Transfer 60 $\mu$ l from each well to another labeled 96-well plate, cover with a plate-sealer, and store at 4 degrees C until Day 6 (for IL6 ELISA). To the remaining 100  $\mu$ l in the cell culture plate, aseptically add Alamar Blue in an amount equal to 10% of the culture volume (10 $\mu$ l).  
10 Return plates to incubator for 3 to 4 hours. Then measure fluorescence with excitation at 530nm and emission at 590nm using the CytoFluor. This yields the growth stimulation/inhibition data.

On day 5, the IL6 ELISA is performed by coating a 96 well plate with 50-100  $\mu$ l/well of Anti-Human IL6 Monoclonal antibody diluted in PBS, pH 7.4, incubate ON at room temperature.

- On day 6, empty the plates into the sink and blot on paper towels. Prepare Assay Buffer containing PBS with 4% BSA. Block the plates with 200  $\mu$ l/well of Pierce Super Block blocking buffer in PBS for 1-2 hr and then wash plates with wash buffer (PBS, 0.05% Tween-20). Blot plates on paper towels. Then add 50  $\mu$ l/well of diluted Anti-Human IL-6 Monoclonal, Biotin-labeled antibody at 0.50 mg/ml. Make dilutions of IL-6 stock in media (30, 10, 3, 1, 0.3, 0 ng/ml).  
20 Add duplicate samples to top row of plate. Cover the plates and incubate for 2 hours at RT on shaker.

Plates are washed with wash buffer and blotted on paper towels. Dilute EU-labeled Streptavidin 1:1000 in Assay buffer, and add 100  $\mu$ l/well. Cover the plate and incubate 1 h at RT. Plates are again washed with wash buffer and blotted on paper towels.

- Add 100  $\mu$ l/well of Enhancement Solution. Shake for 5 minutes. Read the plate on the Wallac DELFIA Fluorometer. Readings from triplicate samples in each assay were tabulated and averaged.  
25

- A positive result in this assay suggests AoSMC cell proliferation and that the polypeptide of the present invention may be involved in dermal fibroblast proliferation and/or  
30 smooth muscle cell proliferation. A positive result also suggests many potential uses of polypeptides, polynucleotides, agonists and/or antagonists of the polynucleotide/polypeptide of the present invention which gives a positive result. For example, inflammation and immune responses, wound healing, and angiogenesis, as detailed throughout this specification. Particularly, polypeptides of the present invention and polynucleotides of the present invention  
35 may be used in wound healing and dermal regeneration, as well as the promotion of vasculogenesis, both of the blood vessels and lymphatics. The growth of vessels can be used in

the treatment of, for example, cardiovascular diseases. Additionally, antagonists of polypeptides and polynucleotides of the invention may be useful in treating diseases, disorders, and/or conditions which involve angiogenesis by acting as an anti-vascular agent (e.g., anti-angiogenesis). These diseases, disorders, and/or conditions are known in the art and/or are described herein, such as, for example, malignancies, solid tumors, benign tumors, for example hemangiomas, acoustic neuromas, neurofibromas, trachomas, and pyogenic granulomas; arteriosclerotic plaques; ocular angiogenic diseases, for example, diabetic retinopathy, retinopathy of prematurity, macular degeneration, corneal graft rejection, neovascular glaucoma, retrolental fibroplasia, rubeosis, retinoblastoma, uveitis and Pterygia (abnormal blood vessel growth) of the eye; rheumatoid arthritis; psoriasis; delayed wound healing; endometriosis; vasculogenesis; granulations; hypertrophic scars (keloids); nonunion fractures; scleroderma; trachoma; vascular adhesions; myocardial angiogenesis; coronary collaterals; cerebral collaterals; arteriovenous malformations; ischemic limb angiogenesis; Osler-Webber Syndrome; plaque neovascularization; telangiectasia; hemophilic joints; angiofibroma; fibromuscular dysplasia; wound granulation; Crohn's disease; and atherosclerosis. Moreover, antagonists of polypeptides and polynucleotides of the invention may be useful in treating anti-hyperproliferative diseases and/or anti-inflammatory known in the art and/or described herein.

One skilled in the art could easily modify the exemplified studies to test the activity of polynucleotides (e.g., gene therapy), antibodies, agonists, and/or antagonists and fragments and variants thereof.

***Example 43: Cellular Adhesion Molecule (CAM) Expression on Endothelial Cells***

The recruitment of lymphocytes to areas of inflammation and angiogenesis involves specific receptor-ligand interactions between cell surface adhesion molecules (CAMs) on lymphocytes and the vascular endothelium. The adhesion process, in both normal and pathological settings, follows a multi-step cascade that involves intercellular adhesion molecule-1 (ICAM-1), vascular cell adhesion molecule-1 (VCAM-1), and endothelial leukocyte adhesion molecule-1 (E-selectin) expression on endothelial cells (EC). The expression of these molecules and others on the vascular endothelium determines the efficiency with which leukocytes may adhere to the local vasculature and extravasate into the local tissue during the development of an inflammatory response. The local concentration of cytokines and growth factor participate in the modulation of the expression of these CAMs.

Briefly, endothelial cells (e.g., Human Umbilical Vein Endothelial cells (HUVECs)) are grown in a standard 96 well plate to confluence, growth medium is removed from the cells and replaced with 100  $\mu$ l of 199 Medium (10% fetal bovine serum (FBS)). Samples for testing and

- positive or negative controls are added to the plate in triplicate (in 10  $\mu$ l volumes). Plates are then incubated at 37°C for either 5 h (selectin and integrin expression) or 24 h (integrin expression only). Plates are aspirated to remove medium and 100  $\mu$ l of 0.1% paraformaldehyde-PBS(with Ca++ and Mg++) is added to each well. Plates are held at 4°C for 30 min. Fixative is removed
- 5 from the wells and wells are washed 1X with PBS(+Ca,Mg) + 0.5% BSA and drained. 10  $\mu$ l of diluted primary antibody is added to the test and control wells. Anti-ICAM-1-Biotin, Anti-VCAM-1-Biotin and Anti-E-selectin-Biotin are used at a concentration of 10  $\mu$ g/ml (1:10 dilution of 0.1 mg/ml stock antibody). Cells are incubated at 37°C for 30 min. in a humidified environment. Wells are washed three times with PBS (+Ca,Mg) + 0.5% BSA. 20  $\mu$ l of diluted
- 10 ExtrAvidin-Alkaline Phosphatase (1:5,000 dilution, referred to herein as the working dilution) are added to each well and incubated at 37°C for 30 min. Wells are washed three times with PBS (+Ca, Mg) +0.5% BSA. Dissolve 1 tablet of p-Nitrophenol Phosphate pNPP per 5 ml of glycine buffer (pH 10.4). 100  $\mu$ l of pNPP substrate in glycine buffer is added to each test well. Standard wells in triplicate are prepared from the working dilution of the ExtrAvidin-Alkaline Phosphatase
- 15 in glycine buffer: 1:5,000 ( $10^0$ ) >  $10^{0.5}$  >  $10^{-1}$  >  $10^{-1.5}$ . 5  $\mu$ l of each dilution is added to triplicate wells and the resulting AP content in each well is 5.50 ng, 1.74 ng, 0.55 ng, 0.18 ng. 100  $\mu$ l of pNPP reagent is then added to each of the standard wells. The plate is incubated at 37°C for 4h. A volume of 50  $\mu$ l of 3M NaOH is added to all wells. The plate is read on a plate reader at 405 nm using the background subtraction option on blank wells filled with glycine buffer only.
- 20 Additionally, the template is set up to indicate the concentration of AP-conjugate in each standard well [5.50 ng; 1.74 ng; 0.55 ng; 0.18 ng]. Results are indicated as amount of bound AP-conjugate in each sample.

#### *Example 44: Alamar Blue Endothelial Cells Proliferation Assay*

- 25 This assay may be used to quantitatively determine protein mediated inhibition of bFGF-induced proliferation of Bovine Lymphatic Endothelial Cells (LECs), Bovine Aortic Endothelial Cells (BAECs) or Human Microvascular Uterine Myometrial Cells (UTMECs). This assay incorporates a fluorometric growth indicator based on detection of metabolic activity. A
- 30 standard Alamar Blue Proliferation Assay is prepared in EGM-2MV with 10 ng /ml of bFGF added as a source of endothelial cell stimulation. This assay may be used with a variety of endothelial cells with slight changes in growth medium and cell concentration. Dilutions of the protein batches to be tested are diluted as appropriate. Serum-free medium (GIBCO SFM) without bFGF is used as a non-stimulated control and Angiostatin or TSP-1 are included as a known
- 35 inhibitory controls.

Briefly, LEC, BAECs or UTMECs are seeded in growth media at a density of 5000 to 2000 cells/well in a 96 well plate and placed at 37 degreesC overnight. After the overnight

incubation of the cells, the growth media is removed and replaced with GIBCO EC-SFM. The cells are treated with the appropriate dilutions of the protein of interest or control protein sample(s) (prepared in SFM) in triplicate wells with additional bFGF to a concentration of 10 ng/ ml. Once the cells have been treated with the samples, the plate(s) is/are placed back in the 37° C incubator  
5 for three days. After three days 10 ml of stock alamar blue (Biosource Cat# DAL1100) is added to each well and the plate(s) is/are placed back in the 37°C incubator for four hours. The plate(s) are then read at 530nm excitation and 590nm emission using the CytoFluor fluorescence reader. Direct output is recorded in relative fluorescence units.

Alamar blue is an oxidation-reduction indicator that both fluoresces and changes color  
10 in response to chemical reduction of growth medium resulting from cell growth. As cells grow in culture, innate metabolic activity results in a chemical reduction of the immediate surrounding environment. Reduction related to growth causes the indicator to change from oxidized (non-fluorescent blue) form to reduced (fluorescent red) form (i.e., stimulated proliferation will produce a stronger signal and inhibited proliferation will produce a weaker signal and the total signal is  
15 proportional to the total number of cells as well as their metabolic activity). The background level of activity is observed with the starvation medium alone. This is compared to the output observed from the positive control samples (bFGF in growth medium) and protein dilutions.

***Example 45: Detection of Inhibition of a Mixed Lymphocyte Reaction***

20 This assay can be used to detect and evaluate inhibition of a Mixed Lymphocyte Reaction (MLR) by gene products (e.g., isolated polypeptides). Inhibition of a MLR may be due to a direct effect on cell proliferation and viability, modulation of costimulatory molecules on interacting cells, modulation of adhesiveness between lymphocytes and accessory cells, or modulation of cytokine production by accessory cells. Multiple cells may be targeted by these  
25 polypeptides since the peripheral blood mononuclear fraction used in this assay includes T, B and natural killer lymphocytes, as well as monocytes and dendritic cells.

Polypeptides of interest found to inhibit the MLR may find application in diseases associated with lymphocyte and monocyte activation or proliferation. These include, but are not limited to, diseases such as asthma, arthritis, diabetes, inflammatory skin conditions, psoriasis,  
30 eczema, systemic lupus erythematosus, multiple sclerosis, glomerulonephritis, inflammatory bowel disease, crohn's disease, ulcerative colitis, arteriosclerosis, cirrhosis, graft vs. host disease, host vs. graft disease, hepatitis, leukemia and lymphoma.

Briefly, PBMCs from human donors are purified by density gradient centrifugation using Lymphocyte Separation Medium (LSM<sup>®</sup>, density 1.0770 g/ml, Organon Teknika  
35 Corporation, West Chester, PA). PBMCs from two donors are adjusted to  $2 \times 10^6$  cells/ml in RPMI-1640 (Life Technologies, Grand Island, NY) supplemented with 10% FCS and 2 mM

glutamine. PBMCs from a third donor is adjusted to  $2 \times 10^5$  cells/ml. Fifty microliters of PBMCs from each donor is added to wells of a 96-well round bottom microtiter plate. Dilutions of test materials (50  $\mu$ l) is added in triplicate to microtiter wells. Test samples (of the protein of interest) are added for final dilution of 1:4; rhuIL-2 (R&D Systems, Minneapolis, MN, catalog number 202-IL) is added to a final concentration of 1  $\mu$ g/ml; anti-CD4 mAb (R&D Systems, clone 34930.11, catalog number MAB379) is added to a final concentration of 10  $\mu$ g/ml. Cells are cultured for 7-8 days at 37°C in 5% CO<sub>2</sub>, and 1  $\mu$ C of [<sup>3</sup>H] thymidine is added to wells for the last 16 hrs of culture. Cells are harvested and thymidine incorporation determined using a Packard TopCount. Data is expressed as the mean and standard deviation of triplicate determinations.

10 Samples of the protein of interest are screened in separate experiments and compared to the negative control treatment, anti-CD4 mAb, which inhibits proliferation of lymphocytes and the positive control treatment, IL-2 (either as recombinant material or supernatant), which enhances proliferation of lymphocytes.

One skilled in the art could easily modify the exemplified studies to test the activity of polynucleotides (e.g., gene therapy), antibodies, agonists, and/or antagonists and fragments and variants thereof.

#### Example 46: Assays for Protease Activity

The following assay may be used to assess protease activity of the polypeptides of the invention.

20 Gelatin and casein zymography are performed essentially as described (Heusen et al., *Anal. Biochem.*, 102:196-202 (1980); Wilson et al., *Journal of Urology*, 149:653-658 (1993)). Samples are run on 10% polyacryamide/0.1% SDS gels containing 1% gelatin or casein, soaked in 2.5% triton at room temperature for 1 hour, and in 0.1M glycine, pH 8.3 at 37°C 5 to 16 hours. After staining in amido black areas of proteolysis appear as clear areas against the blue-black background. Trypsin (Sigma T8642) is used as a positive control.

Protease activity is also determined by monitoring the cleavage of n-a-benzoyl-L-arginine ethyl ester (BAEE) (Sigma B-4500. Reactions are set up in (25mMNaPO<sub>4</sub>, 1mM EDTA, and 1mM BAEE), pH 7.5. Samples are added and the change in adsorbance at 260nm is monitored on the Beckman DU-6 spectrophotometer in the time-drive mode. Trypsin is used as a positive control.

Additional assays based upon the release of acid-soluble peptides from casein or hemoglobin measured as adsorbance at 280 nm or colorimetrically using the Folin method are performed as described in Bergmeyer, et al., *Methods of Enzymatic Analysis*, 5 (1984). Other assays involve the solubilization of chromogenic substrates (Ward, *Applied Science*, 251-317 (1983)).

**Example 47: Identifying Serine Protease Substrate Specificity**

Methods known in the art or described herein may be used to determine the substrate specificity of the polypeptides of the present invention having serine protease activity. A preferred  
5 method of determining substrate specificity is by the use of positional scanning synthetic combinatorial libraries as described in GB 2 324 529 (incorporated herein in its entirety).

**Example 48: Ligand Binding Assays**

The following assay may be used to assess ligand binding activity of the polypeptides  
10 of the invention.

Ligand binding assays provide a direct method for ascertaining receptor pharmacology and are adaptable to a high throughput format. The purified ligand for a polypeptide is radiolabeled to high specific activity (50-2000 Ci/mmol) for binding studies. A determination is then made that the process of radiolabeling does not diminish the activity of the ligand towards its polypeptide.  
15 Assay conditions for buffers, ions, pH and other modulators such as nucleotides are optimized to establish a workable signal to noise ratio for both membrane and whole cell polypeptide sources. For these assays, specific polypeptide binding is defined as total associated radioactivity minus the radioactivity measured in the presence of an excess of unlabeled competing ligand. Where possible, more than one competing ligand is used to define residual nonspecific binding.

20

**Example 49: Functional Assay in *Xenopus* Oocytes**

Capped RNA transcripts from linearized plasmid templates encoding the polypeptides of the invention are synthesized in vitro with RNA polymerases in accordance with standard procedures. In vitro transcripts are suspended in water at a final concentration of 0.2 mg/ml.  
25 Ovarian lobes are removed from adult female toads, Stage V defolliculated oocytes are obtained, and RNA transcripts (10 ng/oocyte) are injected in a 50 nl bolus using a microinjection apparatus. Two electrode voltage clamps are used to measure the currents from individual *Xenopus oocytes* in response polypeptides and polypeptide agonist exposure. Recordings are made in Ca<sup>2+</sup> free Barth's medium at room temperature. The *Xenopus* system can be used to screen known ligands  
30 and tissue/cell extracts for activating ligands.

**Example 50: Microphysiometric Assays**

Activation of a wide variety of secondary messenger systems results in extrusion of small amounts of acid from a cell. The acid formed is largely as a result of the increased metabolic  
35 activity required to fuel the intracellular signaling process. The pH changes in the media surrounding the cell are very small but are detectable by the CYTOSENSOR microphysiometer

(Molecular Devices Ltd., Menlo Park, Calif.). The CYTOSENSOR is thus capable of detecting the activation of polypeptide that is coupled to an energy utilizing intracellular signaling pathway.

**Example 51: Extract/Cell Supernatant Screening**

5           A large number of mammalian receptors exist for which there remains, as yet, no cognate activating ligand (agonist). Thus, active ligands for these receptors may not be included within the ligands banks as identified to date. Accordingly, the polypeptides of the invention can also be functionally screened (using calcium, cAMP, microphysiometer, oocyte electrophysiology, etc., functional screens) against tissue extracts to identify its natural ligands. Extracts that produce  
10           positive functional responses can be sequentially subfractionated until an activating ligand is isolated and identified.

**Example 52: Calcium and cAMP Functional Assays**

          Seven transmembrane receptors which are expressed in HEK 293 cells have been  
15           shown to be coupled functionally to activation of PLC and calcium mobilization and/or cAMP stimulation or inhibition. Basal calcium levels in the HEK 293 cells in receptor-transfected or vector control cells were observed to be in the normal, 100 nM to 200 nM, range. HEK 293 cells expressing recombinant receptors are loaded with fura 2 and in a single day >150 selected ligands or tissue/cell extracts are evaluated for agonist induced calcium mobilization. Similarly, HEK 293  
20           cells expressing recombinant receptors are evaluated for the stimulation or inhibition of cAMP production using standard cAMP quantitation assays. Agonists presenting a calcium transient or cAMP fluctuation are tested in vector control cells to determine if the response is unique to the transfected cells expressing receptor.

**Example 53: ATP-binding assay**

25           The following assay may be used to assess ATP-binding activity of polypeptides of the invention.

          ATP-binding activity of the polypeptides of the invention may be detected using the ATP-binding assay described in U.S. Patent 5,858,719, which is herein incorporated by reference  
30           in its entirety. Briefly, ATP-binding to polypeptides of the invention is measured via photoaffinity labeling with 8-azido-ATP in a competition assay. Reaction mixtures containing 1 mg/ml of the ABC transport protein of the present invention are incubated with varying concentrations of ATP, or the non-hydrolyzable ATP analog adenylyl-5'-imidodiphosphate for 10 minutes at 4°C. A mixture of 8-azido-ATP (Sigma Chem. Corp., St. Louis, MO.) plus 8-azido-ATP (<sup>32</sup>P-ATP) (5 mCi/μmol,  
35           ICN, Irvine CA.) is added to a final concentration of 100 μM and 0.5 ml aliquots are placed in the wells of a porcelain spot plate on ice. The plate is irradiated using a short wave 254 nm UV lamp



at a distance of 2.5 cm from the plate for two one-minute intervals with a one-minute cooling interval in between. The reaction is stopped by addition of dithiothreitol to a final concentration of 2mM. The incubations are subjected to SDS-PAGE electrophoresis, dried, and autoradiographed. Protein bands corresponding to the particular polypeptides of the invention are excised, and the  
5 radioactivity quantified. A decrease in radioactivity with increasing ATP or adenly-5'-imidodiphosphate provides a measure of ATP affinity to the polypeptides.

#### *Example 54: Small Molecule Screening*

This invention is particularly useful for screening therapeutic compounds by using the  
10 polypeptides of the invention, or binding fragments thereof, in any of a variety of drug screening techniques. The polypeptide or fragment employed in such a test may be affixed to a solid support, expressed on a cell surface, free in solution, or located intracellularly. One method of drug screening utilizes eukaryotic or prokaryotic host cells which are stably transformed with recombinant nucleic acids expressing the polypeptide or fragment. Drugs are screened against such  
15 transformed cells in competitive binding assays. One may measure, for example, the formulation of complexes between the agent being tested and polypeptide of the invention.

Thus, the present invention provides methods of screening for drugs or any other agents which affect activities mediated by the polypeptides of the invention. These methods comprise contacting such an agent with a polypeptide of the invention or fragment thereof and  
20 assaying for the presence of a complex between the agent and the polypeptide or fragment thereof, by methods well known in the art. In such a competitive binding assay, the agents to screen are typically labeled. Following incubation, free agent is separated from that present in bound form, and the amount of free or uncomplexed label is a measure of the ability of a particular agent to bind to the polypeptides of the invention.

25 Another technique for drug screening provides high throughput screening for compounds having suitable binding affinity to the polypeptides of the invention, and is described in great detail in European Patent Application 84/03564, published on September 13, 1984, which is herein incorporated by reference in its entirety. Briefly stated, large numbers of different small molecule test compounds are synthesized on a solid substrate, such as plastic pins or some other  
30 surface. The test compounds are reacted with polypeptides of the invention and washed. Bound polypeptides are then detected by methods well known in the art. Purified polypeptides are coated directly onto plates for use in the aforementioned drug screening techniques. In addition, non-neutralizing antibodies may be used to capture the peptide and immobilize it on the solid support.

This invention also contemplates the use of competitive drug screening assays in  
35 which neutralizing antibodies capable of binding polypeptides of the invention specifically compete with a test compound for binding to the polypeptides or fragments thereof. In this

manner, the antibodies are used to detect the presence of any peptide that shares one or more antigenic epitopes with a polypeptide of the invention.

*Example 55: Phosphorylation Assay*

5           In order to assay for phosphorylation activity of the polypeptides of the invention, a phosphorylation assay as described in U.S. Patent 5,958,405 (which is herein incorporated by reference) is utilized. Briefly, phosphorylation activity may be measured by phosphorylation of a protein substrate using gamma-labeled  $^{32}\text{P}$ -ATP and quantitation of the incorporated radioactivity using a gamma radioisotope counter. The polypeptides of the invention are incubated with the  
10   protein substrate,  $^{32}\text{P}$ -ATP, and a kinase buffer. The  $^{32}\text{P}$  incorporated into the substrate is then separated from free  $^{32}\text{P}$ -ATP by electrophoresis, and the incorporated  $^{32}\text{P}$  is counted and compared to a negative control. Radioactivity counts above the negative control are indicative of phosphorylation activity of the polypeptides of the invention.

15           ***Example 56: Detection of Phosphorylation Activity (Activation) of the Polypeptides of the Invention in the Presence of Polypeptide Ligands***

          Methods known in the art or described herein may be used to determine the phosphorylation activity of the polypeptides of the invention. A preferred method of determining  
20   phosphorylation activity is by the use of the tyrosine phosphorylation assay as described in US 5,817,471 (incorporated herein by reference).

***Example 57: Identification Of Signal Transduction Proteins That Interact With Polypeptides Of The Present Invention***

25           The purified polypeptides of the invention are research tools for the identification, characterization and purification of additional signal transduction pathway proteins or receptor proteins. Briefly, labeled polypeptides of the invention are useful as reagents for the purification of molecules with which it interacts. In one embodiment of affinity purification, polypeptides of the  
30   invention are covalently coupled to a chromatography column. Cell-free extract derived from putative target cells, such as carcinoma tissues, is passed over the column, and molecules with appropriate affinity bind to the polypeptides of the invention. The protein complex is recovered from the column, dissociated, and the recovered molecule subjected to N-terminal protein sequencing. This amino acid sequence is then used to identify the captured molecule or to design  
35   degenerate oligonucleotide probes for cloning the relevant gene from an appropriate cDNA library.

**Example 58: IL-6 Bioassay**

To test the proliferative effects of the polypeptides of the invention, the IL-6 Bioassay as described by Marz *et al.* is utilized (*Proc. Natl. Acad. Sci., U.S.A.*, 95:3251-56 (1998), which is herein incorporated by reference). Briefly, IL-6 dependent B9 murine cells are washed three times in IL-6 free medium and plated at a concentration of 5,000 cells per well in 50  $\mu$ l, and 50  $\mu$ l of the IL-6-like polypeptide is added. After 68 hrs. at 37°C, the number of viable cells is measured by adding the tetrazolium salt thiazolyl blue (MTT) and incubating for a further 4 hrs. at 37°C. B9 cells are lysed by SDS and optical density is measured at 570 nm. Controls containing IL-6 (positive) and no cytokine (negative) are utilized. Enhanced proliferation in the test sample(s) relative to the negative control is indicative of proliferative effects mediated by polypeptides of the invention.

**Example 59: Support of Chicken Embryo Neuron Survival**

To test whether sympathetic neuronal cell viability is supported by polypeptides of the invention, the chicken embryo neuronal survival assay of Senaldi *et al.* is utilized (*Proc. Natl. Acad. Sci., U.S.A.*, 96:11458-63 (1998), which is herein incorporated by reference). Briefly, motor and sympathetic neurons are isolated from chicken embryos, resuspended in L15 medium (with 10% FCS, glucose, sodium selenite, progesterone, conalbumin, putrescine, and insulin; Life Technologies, Rockville, MD.) and Dulbecco's modified Eagles medium [with 10% FCS, glutamine, penicillin, and 25 mM Hepes buffer (pH 7.2); Life Technologies, Rockville, MD.], respectively, and incubated at 37°C in 5% CO<sub>2</sub> in the presence of different concentrations of the purified IL-6-like polypeptide, as well as a negative control lacking any cytokine. After 3 days, neuron survival is determined by evaluation of cellular morphology, and through the use of the colorimetric assay of Mosmann (Mosmann, T., *J. Immunol. Methods*, 65:55-63 (1983)). Enhanced neuronal cell viability as compared to the controls lacking cytokine is indicative of the ability of the inventive purified IL-6-like polypeptide(s) to enhance the survival of neuronal cells.

30

**Example 60: Assay for Phosphatase Activity**

The following assay may be used to assess serine/threonine phosphatase (PTPase) activity of the polypeptides of the invention.

In order to assay for serine/threonine phosphatase (PTPase) activity, assays can be utilized which are widely known to those skilled in the art. For example, the serine/threonine

phosphatase (PSPase) activity is measured using a PSPase assay kit from New England Biolabs, Inc. Myelin basic protein (MyBP), a substrate for PSPase, is phosphorylated on serine and threonine residues with cAMP-dependent Protein Kinase in the presence of [<sup>32</sup>P]ATP. Protein serine/threonine phosphatase activity is then determined by measuring the release of inorganic phosphate from 32P-labeled MyBP.

***Example 61: Interaction of Serine/Threonine Phosphatases with other Proteins***

The polypeptides of the invention with serine/threonine phosphatase activity as determined in Example 60 are research tools for the identification, characterization and purification of additional interacting proteins or receptor proteins, or other signal transduction pathway proteins. Briefly, labeled polypeptide(s) of the invention is useful as a reagent for the purification of molecules with which it interacts. In one embodiment of affinity purification, polypeptide of the invention is covalently coupled to a chromatography column. Cell-free extract derived from putative target cells, such as neural or liver cells, is passed over the column, and molecules with appropriate affinity bind to the polypeptides of the invention. The polypeptides of the invention -complex is recovered from the column, dissociated, and the recovered molecule subjected to N-terminal protein sequencing. This amino acid sequence is then used to identify the captured molecule or to design degenerate oligonucleotide probes for cloning the relevant gene from an appropriate cDNA library.

***Example 62: Assaying for Heparanase Activity***

In order to assay for heparanase activity of the polypeptides of the invention, the heparanase assay described by Vlodavsky et al is utilized (Vlodavsky, I., et al., Nat. Med., 5:793-802 (1999)). Briefly, cell lysates, conditioned media or intact cells (1 x 10<sup>6</sup> cells per 35-mm dish) are incubated for 18 hrs at 37°C, pH 6.2-6.6, with <sup>35</sup>S-labeled ECM or soluble ECM derived peak I proteoglycans. The incubation medium is centrifuged and the supernatant is analyzed by gel filtration on a Sepharose CL-6B column (0.9 x 30 cm). Fractions are eluted with PBS and their radioactivity is measured. Degradation fragments of heparan sulfate side chains are eluted from Sepharose 6B at 0.5 < K<sub>av</sub> < 0.8 (peak II). Each experiment is done at least three times. Degradation fragments corresponding to "peak II," as described by Vlodavsky et al., is indicative of the activity of the polypeptides of the invention in cleaving heparan sulfate.

***Example 63: Immobilization of biomolecules***

This example provides a method for the stabilization of polypeptides of the invention

in non-host cell lipid bilayer constructs (see, e.g., Bieri et al., Nature Biotech 17:1105-1108 (1999), hereby incorporated by reference in its entirety herein) that can be adapted for the study of polypeptides of the invention in the various functional assays described above. Briefly, carbohydrate-specific chemistry for biotinylation is used to confine a biotin tag to the extracellular domain of the polypeptides of the invention, thus allowing uniform orientation upon immobilization. A 50uM solution of polypeptides of the invention in washed membranes is incubated with 20 mM NaIO<sub>4</sub> and 1.5 mg/ml (4mM) BACH or 2 mg/ml (7.5mM) biotin-hydrazide for 1 hr at room temperature (reaction volume, 150ul). Then the sample is dialyzed (Pierce Slidealizer Cassett, 10 kDa cutoff; Pierce Chemical Co., Rockford IL) at 4C first for 5 h, exchanging the buffer after each hour, and finally for 12 h against 500 ml buffer R (0.15 M NaCl, 1 mM MgCl<sub>2</sub>, 10 mM sodium phosphate, pH7). Just before addition into a cuvette, the sample is diluted 1:5 in buffer ROG50 (Buffer R supplemented with 50 mM octylglucoside).

#### Example 64: TAQMAN

Quantitative PCR (QPCR). Total RNA from cells in culture are extracted by Trizol separation as recommended by the supplier (LifeTechnologies). (Total RNA is treated with DNase I (Life Technologies) to remove any contaminating genomic DNA before reverse transcription.) Total RNA (50 ng) is used in a one-step, 50ul, RT-QPCR, consisting of Taqman Buffer A (Perkin-Elmer; 50 mM KCl/10 mM Tris, pH 8.3), 5.5 mM MgCl<sub>2</sub>, 240 μM each dNTP, 0.4 units RNase inhibitor (Promega), 8%glycerol, 0.012% Tween-20, 0.05% gelatin, 0.3uM primers, 0.1uM probe, 0.025units Amplitaq Gold (Perkin-Elmer) and 2.5 units Superscript II reverse transcriptase (Life Technologies). As a control for genomic contamination, parallel reactions are setup without reverse transcriptase. The relative abundance of (unknown) and 18S RNAs are assessed by using the Applied Biosystems Prism 7700 Sequence Detection System (Livak, K. J., Flood, S. J., Marmaro, J., Giusti, W. & Deetz, K. (1995) PCR Methods Appl. 4, 357-362). Reactions are carried out at 48°C for 30 min, 95°C for 10 min, followed by 40 cycles of 95°C for 15s, 60°C for 1 min. Reactions are performed in triplicate.

Primers (f & r) and FRET probes sets are designed using Primer Express Software (Perkin-Elmer). Probes are labeled at the 5'-end with the reporter dye 6-FAM and on the 3'-end with the quencher dye TAMRA (Biosource International, Camarillo, CA or Perkin-Elmer).

#### Example 65: Assays for Metalloproteinase Activity

Metalloproteinases (EC 3.4.24.-) are peptide hydrolases which use metal ions, such as Zn<sup>2+</sup>, as the catalytic mechanism. Metalloproteinase activity of polypeptides of the present

invention can be assayed according to the following methods.

*Proteolysis of alpha-2-macroglobulin*

To confirm protease activity, purified polypeptides of the invention are mixed with the  
5 substrate alpha-2-macroglobulin (0.2 unit/ml; Boehringer Mannheim, Germany) in 1x assay buffer  
(50 mM HEPES, pH 7.5, 0.2 M NaCl, 10 mM CaCl<sub>2</sub>, 25 μM ZnCl<sub>2</sub> and 0.05% Brij-35) and  
incubated at 37°C for 1-5 days. Trypsin is used as positive control. Negative controls contain only  
alpha-2-macroglobulin in assay buffer. The samples are collected and boiled in SDS-PAGE  
10 sample buffer containing 5% 2-mercaptoethanol for 5-min, then loaded onto 8% SDS-  
polyacrylamide gel. After electrophoresis the proteins are visualized by silver staining. Proteolysis  
is evident by the appearance of lower molecular weight bands as compared to the negative control.

*Inhibition of alpha-2-macroglobulin proteolysis by inhibitors of metalloproteinases*

Known metalloproteinase inhibitors (metal chelators (EDTA, EGTA, AND HgCl<sub>2</sub>),  
15 peptide metalloproteinase inhibitors (TIMP-1 and TIMP-2), and commercial small molecule MMP  
inhibitors) are used to characterize the proteolytic activity of polypeptides of the invention. The  
three synthetic MMP inhibitors used are: MMP inhibitor I, [IC<sub>50</sub> = 1.0 μM against MMP-1 and  
MMP-8; IC<sub>50</sub> = 30 μM against MMP-9; IC<sub>50</sub> = 150 μM against MMP-3]; MMP-3 (stromelysin-1)  
inhibitor I [IC<sub>50</sub> = 5 μM against MMP-3], and MMP-3 inhibitor II [K<sub>i</sub> = 130 nM against MMP-3];  
20 inhibitors available through Calbiochem, catalog # 444250, 444218, and 444225, respectively).  
Briefly, different concentrations of the small molecule MMP inhibitors are mixed with purified  
polypeptides of the invention (50μg/ml) in 22.9 μl of 1x HEPES buffer (50 mM HEPES, pH 7.5,  
0.2 M NaCl, 10 mM CaCl<sub>2</sub>, 25 μM ZnCl<sub>2</sub> and 0.05%Brij-35) and incubated at room temperature  
(24 °C) for 2-hr, then 7.1 μl of substrate alpha-2-macroglobulin (0.2 unit/ml) is added and  
25 incubated at 37°C for 20-hr. The reactions are stopped by adding 4x sample buffer and boiled  
immediately for 5 minutes. After SDS-PAGE, the protein bands are visualized by silver stain.

*Synthetic Fluorogenic Peptide Substrates Cleavage Assay*

The substrate specificity for polypeptides of the invention with demonstrated  
30 metalloproteinase activity can be determined using synthetic fluorogenic peptide substrates  
(purchased from BACHEM Bioscience Inc). Test substrates include, M-1985, M-2225, M-2105,  
M-2110, and M-2255. The first four are MMP substrates and the last one is a substrate of tumor  
necrosis factor-α (TNF-α) converting enzyme (TACE). All the substrates are prepared in 1:1  
dimethyl sulfoxide (DMSO) and water. The stock solutions are 50-500 μM. Fluorescent assays are  
35 performed by using a Perkin Elmer LS 50B luminescence spectrometer equipped with a constant  
temperature water bath. The excitation λ is 328 nm and the emission λ is 393 nm. Briefly, the

assay is carried out by incubating 176  $\mu$ l 1x HEPES buffer (0.2 M NaCl, 10 mM CaCl<sub>2</sub>, 0.05% Brij-35 and 50 mM HEPES, pH 7.5) with 4  $\mu$ l of substrate solution (50  $\mu$ M) at 25 °C for 15 minutes, and then adding 20  $\mu$ l of a purified polypeptide of the invention into the assay cuvette. The final concentration of substrate is 1  $\mu$ M. Initial hydrolysis rates are monitored for 30-min.

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***Example 66: Characterization of the cDNA contained in a deposited plasmid***

The size of the cDNA insert contained in a deposited plasmid may be routinely determined using techniques known in the art, such as PCR amplification using synthetic primers hybridizable to the 3' and 5' ends of the cDNA sequence. For example, two primers of 17-30 nucleotides derived from each end of the cDNA (i.e., hybridizable to the absolute 5' nucleotide or the 3' nucleotide end of the sequence of SEQ ID NO:X, respectively) are synthesized and used to amplify the cDNA using the deposited cDNA plasmid as a template. The polymerase chain reaction is carried out under routine conditions, for instance, in 25  $\mu$ l of reaction mixture with 0.5  $\mu$ g of the above cDNA template. A convenient reaction mixture is 1.5-5 mM MgCl<sub>2</sub>, 0.01% (w/v) gelatin, 20  $\mu$ M each of dATP, dCTP, dGTP, dTTP, 25 pmol of each primer and 0.25 Unit of Taq polymerase. Thirty five cycles of PCR (denaturation at 94 degree C for 1 min; annealing at 55 degree C for 1 min; elongation at 72 degree C for 1 min) are performed with a Perkin-Elmer Cetus automated thermal cycler. The amplified product is analyzed by agarose gel electrophoresis. The PCR product is verified to be the selected sequence by subcloning and sequencing the DNA product. It will be clear that the invention may be practiced otherwise than as particularly described in the foregoing description and examples. Numerous modifications and variations of the present invention are possible in light of the above teachings and, therefore, are within the scope of the appended claims.

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***Incorporation by Reference***

The entire disclosure of each document cited (including patents, patent applications, journal articles, abstracts, laboratory manuals, books, or other disclosures) in the Background of the Invention, Detailed Description, and Examples is hereby incorporated herein by reference. In addition, the sequence listing submitted herewith is incorporated herein by reference in its entirety. The specification and sequence listing of each of the following U.S. and PCT applications are herein incorporated by reference in their entirety: U.S. Appln. No. 60/040,162 filed on 07-Mar-1997, U.S. Appln. No. 60/043,576 filed on 11-Apr-1997, U.S. Appln. No. 60/047,601 filed on 23-May-1997, U.S. Appln. No. 60/056,845 filed on 22-Aug-1997, U.S. Appln. No. 60/043,580 filed on 11-Apr-1997, U.S. Appln. No. 60/047,599 filed on 23-May-1997, U.S. Appln. No. 60/056,664 filed on 22-Aug-1997, U.S. Appln. No. 60/043,314 filed on 11-Apr-1997, U.S. Appln. No.

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60/047,632 filed on 23-May-1997, U.S. Appln. No. 60/056,892 filed on 22-Aug-1997, U.S. Appln. No. 60/043,568 filed on 11-Apr-1997, U.S. Appln. No. 60/047,595 filed on 23-May-1997, U.S. Appln. No. 60/056,632 filed on 22-Aug-1997, U.S. Appln. No. 60/043,578 filed on 11-Apr-1997, U.S. Appln. No. 60/040,333 filed on 07-Mar-1997, U.S. Appln. No. 60/043,670 filed on 11-Apr-1997, U.S. Appln. No. 60/047,596 filed on 23-May-1997, U.S. Appln. No. 60/056,864 filed on 22-Aug-1997, U.S. Appln. No. 60/043,674 filed on 11-Apr-1997, U.S. Appln. No. 60/047,612 filed on 23-May-1997, U.S. Appln. No. 60/056,631 filed on 22-Aug-1997, U.S. Appln. No. 60/043,569 filed on 11-Apr-1997, U.S. Appln. No. 60/047,588 filed on 23-May-1997, U.S. Appln. No. 60/056,876 filed on 22-Aug-1997, U.S. Appln. No. 60/043,671 filed on 11-Apr-1997, U.S. Appln. No. 60/043,311 filed on 11-Apr-1997, U.S. Appln. No. 60/038,621 filed on 07-Mar-1997, U.S. Appln. No. 60/043,672 filed on 11-Apr-1997, U.S. Appln. No. 60/047,613 filed on 23-May-1997, U.S. Appln. No. 60/056,636 filed on 22-Aug-1997, U.S. Appln. No. 60/043,669 filed on 11-Apr-1997, U.S. Appln. No. 60/047,582 filed on 23-May-1997, U.S. Appln. No. 60/056,910 filed on 22-Aug-1997, U.S. Appln. No. 60/043,315 filed on 11-Apr-1997, U.S. Appln. No. 60/047,598 filed on 23-May-1997, U.S. Appln. No. 60/056,874 filed on 22-Aug-1997, U.S. Appln. No. 60/043,312 filed on 11-Apr-1997, U.S. Appln. No. 60/047,585 filed on 23-May-1997, U.S. Appln. No. 60/056,881 filed on 22-Aug-1997, U.S. Appln. No. 60/043,313 filed on 11-Apr-1997, U.S. Appln. No. 60/047,586 filed on 23-May-1997, U.S. Appln. No. 60/056,909 filed on 22-Aug-1997, U.S. Appln. No. 60/040,161 filed on 07-Mar-1997, U.S. Appln. No. 60/047,587 filed on 23-May-1997, U.S. Appln. No. 60/056,879 filed on 22-Aug-1997, U.S. Appln. No. 60/047,500 filed on 23-May-1997, U.S. Appln. No. 60/056,880 filed on 22-Aug-1997, U.S. Appln. No. 60/047,584 filed on 23-May-1997, U.S. Appln. No. 60/056,894 filed on 22-Aug-1997, U.S. Appln. No. 60/047,492 filed on 23-May-1997, U.S. Appln. No. 60/056,911 filed on 22-Aug-1997, U.S. Appln. No. 60/040,626 filed on 07-Mar-1997, U.S. Appln. No. 60/047,503 filed on 23-May-1997, U.S. Appln. No. 60/056,903 filed on 22-Aug-1997, U.S. Appln. No. 60/047,501 filed on 23-May-1997, U.S. Appln. No. 60/056,637 filed on 22-Aug-1997, U.S. Appln. No. 60/047,590 filed on 23-May-1997, U.S. Appln. No. 60/056,875 filed on 22-Aug-1997, U.S. Appln. No. 60/047,581 filed on 23-May-1997, U.S. Appln. No. 60/056,882 filed on 22-Aug-1997, U.S. Appln. No. 60/047,592 filed on 23-May-1997, U.S. Appln. No. 60/056,888 filed on 22-Aug-1997, U.S. Appln. No. 60/040,334 filed on 07-Mar-1997, U.S. Appln. No. 60/047,618 filed on 23-May-1997, U.S. Appln. No. 60/056,872 filed on 22-Aug-1997, U.S. Appln. No. 60/047,617 filed on 23-May-1997, U.S. Appln. No. 60/056,662 filed on 22-Aug-1997, U.S. Appln. No. 60/047,589 filed on 23-May-1997, U.S. Appln. No. 60/056,862 filed on 22-Aug-1997, U.S. Appln. No. 60/047,594 filed on 23-May-1997, U.S. Appln. No. 60/056,884 filed on 22-Aug-1997, U.S. Appln. No. 60/047,583 filed on 23-May-1997, U.S. Appln. No. 60/056,878 filed on 22-Aug-1997, U.S. Appln. No. 60/040,336 filed on 07-Mar-1997, U.S. Appln. No. 60/047,502 filed on 23-May-1997, U.S. Appln. No. 60/056,893 filed on 22-Aug-1997, U.S. Appln. No. 60/047,633 filed on 23-May-1997, U.S. Appln. No. 60/056,630 filed on 22-



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U.S. Appln. No. 60/056,073 filed on 29-Aug-1997, U.S. Appln. No. 60/057,669 filed on 05-Sep-  
1997, U.S. Appln. No. 60/057,663 filed on 05-Sep-1997, U.S. Appln. No. 60/057,626 filed on 05-  
Sep-1997, U.S. Appln. No. 60/058,666 filed on 12-Sep-1997, U.S. Appln. No. 60/058,973 filed on  
12-Sep-1997, U.S. Appln. No. 60/058,974 filed on 12-Sep-1997, U.S. Appln. No. 60/058,667 filed  
35 on 12-Sep-1997, U.S. Appln. No. 60/060,837 filed on 02-Oct-1997, U.S. Appln. No. 60/060,862  
filed on 02-Oct-1997, U.S. Appln. No. 60/060,839 filed on 02-Oct-1997, U.S. Appln. No.  
60/060,866 filed on 02-Oct-1997, U.S. Appln. No. 60/060,843 filed on 02-Oct-1997, U.S. Appln.

No. 60/060,836 filed on 02-Oct-1997, U.S. Appln. No. 60/060,838 filed on 02-Oct-1997, U.S. Appln. No. 60/060,874 filed on 02-Oct-1997, U.S. Appln. No. 60/060,833 filed on 02-Oct-1997, U.S. Appln. No. 60/060,884 filed on 02-Oct-1997, U.S. Appln. No. 60/060,880 filed on 02-Oct-1997, U.S. Appln. No. 60/061,463 filed on 09-Oct-1997, U.S. Appln. No. 60/061,529 filed on 09-  
5 Oct-1997, U.S. Appln. No. 60/071,498 filed on 09-Oct-1997, U.S. Appln. No. 60/061,527 filed on 09-Oct-1997, U.S. Appln. No. 60/061,536 filed on 09-Oct-1997, U.S. Appln. No. 60/061,532 filed on 09-Oct-1997, U.S. Appln. No. 60/063,099 filed on 24-Oct-1997, U.S. Appln. No. 60/063,088 filed on 24-Oct-1997, U.S. Appln. No. 60/063,100 filed on 24-Oct-1997, U.S. Appln. No. 60/063,387 filed on 24-Oct-1997, U.S. Appln. No. 60/063,148 filed on 24-Oct-1997, U.S. Appln.  
10 No. 60/063,386 filed on 24-Oct-1997, U.S. Appln. No. 60/062,784 filed on 24-Oct-1997, U.S. Appln. No. 60/063,091 filed on 24-Oct-1997, U.S. Appln. No. 60/063,090 filed on 24-Oct-1997, U.S. Appln. No. 60/063,089 filed on 24-Oct-1997, U.S. Appln. No. 60/063,092 filed on 24-Oct-1997, U.S. Appln. No. 60/063,111 filed on 24-Oct-1997, U.S. Appln. No. 60/063,101 filed on 24-Oct-1997, U.S. Appln. No. 60/063,109 filed on 24-Oct-1997, U.S. Appln. No. 60/063,110 filed on  
15 24-Oct-1997, U.S. Appln. No. 60/063,098 filed on 24-Oct-1997, U.S. Appln. No. 60/063,097 filed on 24-Oct-1997, U.S. Appln. No. 60/064,911 filed on 07-Nov-1997, U.S. Appln. No. 60/064,912 filed on 07-Nov-1997, U.S. Appln. No. 60/064,983 filed on 07-Nov-1997, U.S. Appln. No. 60/064,900 filed on 07-Nov-1997, U.S. Appln. No. 60/064,988 filed on 07-Nov-1997, U.S. Appln. No. 60/064,987 filed on 07-Nov-1997, U.S. Appln. No. 60/064,908 filed on 07-Nov-1997, U.S.  
20 Appln. No. 60/064,984 filed on 07-Nov-1997, U.S. Appln. No. 60/064,985 filed on 07-Nov-1997, U.S. Appln. No. 60/066,094 filed on 17-Nov-1997, U.S. Appln. No. 60/066,100 filed on 17-Nov-1997, U.S. Appln. No. 60/066,089 filed on 17-Nov-1997, U.S. Appln. No. 60/066,095 filed on 17-Nov-1997, U.S. Appln. No. 60/066,090 filed on 17-Nov-1997, U.S. Appln. No. 60/068,006 filed on 18-Dec-1997, U.S. Appln. No. 60/068,057 filed on 18-Dec-1997, U.S. Appln. No. 60/068,007  
25 filed on 18-Dec-1997, U.S. Appln. No. 60/068,008 filed on 18-Dec-1997, U.S. Appln. No. 60/068,054 filed on 18-Dec-1997, U.S. Appln. No. 60/068,064 filed on 18-Dec-1997, U.S. Appln. No. 60/068,053 filed on 18-Dec-1997, U.S. Appln. No. 60/070,923 filed on 18-Dec-1997, U.S. Appln. No. 60/068,365 filed on 19-Dec-1997, U.S. Appln. No. 60/068,169 filed on 19-Dec-1997, U.S. Appln. No. 60/068,367 filed on 19-Dec-1997, U.S. Appln. No. 60/068,369 filed on 19-Dec-  
30 1997, U.S. Appln. No. 60/068,368 filed on 19-Dec-1997, U.S. Appln. No. 60/070,657 filed on 07-Jan-1998, U.S. Appln. No. 60/070,692 filed on 07-Jan-1998, U.S. Appln. No. 60/070,704 filed on 07-Jan-1998, U.S. Appln. No. 60/070,658 filed on 07-Jan-1998, U.S. Appln. No. 60/073,160 filed on 30-Jan-1998, U.S. Appln. No. 60/073,159 filed on 30-Jan-1998, U.S. Appln. No. 60/073,165 filed on 30-Jan-1998, U.S. Appln. No. 60/073,164 filed on 30-Jan-1998, U.S. Appln. No.  
35 60/073,167 filed on 30-Jan-1998, U.S. Appln. No. 60/073,162 filed on 30-Jan-1998, U.S. Appln. No. 60/073,161 filed on 30-Jan-1998, U.S. Appln. No. 60/073,170 filed on 30-Jan-1998, U.S. Appln. No. 60/074,141 filed on 09-Feb-1998, U.S. Appln. No. 60/074,341 filed on 09-Feb-1998,

U.S. Appln. No. 60/074,037 filed on 09-Feb-1998, U.S. Appln. No. 60/074,157 filed on 09-Feb-1998, U.S. Appln. No. 60/074,118 filed on 09-Feb-1998, U.S. Appln. No. 60/076,051 filed on 26-Feb-1998, U.S. Appln. No. 60/076,053 filed on 26-Feb-1998, U.S. Appln. No. 60/076,054 filed on 26-Feb-1998, U.S. Appln. No. 60/076,052 filed on 26-Feb-1998, U.S. Appln. No. 60/076,057 filed  
5 on 26-Feb-1998, U.S. Appln. No. 60/077,714 filed on 12-Mar-1998, U.S. Appln. No. 60/077,687 filed on 12-Mar-1998, U.S. Appln. No. 60/077,686 filed on 12-Mar-1998, U.S. Appln. No. 60/077,696 filed on 12-Mar-1998, U.S. Appln. No. 60/078,566 filed on 19-Mar-1998, U.S. Appln. No. 60/078,574 filed on 19-Mar-1998, U.S. Appln. No. 60/078,576 filed on 19-Mar-1998, U.S. Appln. No. 60/078,579 filed on 19-Mar-1998, U.S. Appln. No. 60/078,563 filed on 19-Mar-1998,  
10 U.S. Appln. No. 60/078,573 filed on 19-Mar-1998, U.S. Appln. No. 60/078,578 filed on 19-Mar-1998, U.S. Appln. No. 60/078,581 filed on 19-Mar-1998, U.S. Appln. No. 60/078,577 filed on 19-Mar-1998, U.S. Appln. No. 60/080,314 filed on 01-Apr-1998, U.S. Appln. No. 60/080,312 filed on 01-Apr-1998, U.S. Appln. No. 60/080,313 filed on 01-Apr-1998, U.S. Appln. No. 60/085,180 filed on 12-May-1998, U.S. Appln. No. 60/085,105 filed on 12-May-1998, U.S. Appln. No. 60/085,094  
15 filed on 12-May-1998, U.S. Appln. No. 60/085,093 filed on 12-May-1998, U.S. Appln. No. 60/085,924 filed on 18-May-1998, U.S. Appln. No. 60/085,906 filed on 18-May-1998, U.S. Appln. No. 60/085,927 filed on 18-May-1998, U.S. Appln. No. 60/085,920 filed on 18-May-1998, U.S. Appln. No. 60/085,928 filed on 18-May-1998, U.S. Appln. No. 60/085,925 filed on 18-May-1998, U.S. Appln. No. 60/085,921 filed on 18-May-1998, U.S. Appln. No. 60/085,923 filed on 18-  
20 May-1998, U.S. Appln. No. 60/085,922 filed on 18-May-1998, U.S. Appln. No. 60/090,112 filed on 22-Jun-1998, U.S. Appln. No. 60/089,508 filed on 16-Jun-1998, U.S. Appln. No. 60/089,507 filed on 16-Jun-1998, U.S. Appln. No. 60/089,510 filed on 16-Jun-1998, U.S. Appln. No. 60/089,509 filed on 16-Jun-1998, U.S. Appln. No. 60/090,113 filed on 22-Jun-1998, U.S. Appln. No. 60/092,956 filed on 15-Jul-1998, U.S. Appln. No. 60/092,921 filed on 15-Jul-1998, U.S.  
25 Appln. No. 60/092,922 filed on 15-Jul-1998, U.S. Appln. No. 60/094,657 filed on 30-Jul-1998, U.S. Appln. No. 60/095,486 filed on 05-Aug-1998, U.S. Appln. No. 60/096,319 filed on 12-Aug-1998, U.S. Appln. No. 60/095,455 filed on 06-Aug-1998, U.S. Appln. No. 60/095,454 filed on 06-Aug-1998, U.S. Appln. No. 60/097,917 filed on 25-Aug-1998, U.S. Appln. No. 60/098,634 filed on 31-Aug-1998, U.S. Appln. No. 60/101,546 filed on 23-Sep-1998, U.S. Appln. No. 60/102,895  
30 filed on 02-Oct-1998, U.S. Appln. No. 60/108,207 filed on 12-Nov-1998, U.S. Appln. No. 60/113,006 filed on 18-Dec-1998, U.S. Appln. No. 60/112,809 filed on 17-Dec-1998, U.S. Appln. No. 60/116,330 filed on 19-Jan-1999, U.S. Appln. No. 60/119,468 filed on 10-Feb-1999, U.S. Appln. No. 60/125,055 filed on 18-Mar-1999, U.S. Appln. No. 60/128,693 filed on 09-Apr-1999, U.S. Appln. No. 60/130,991 filed on 26-Apr-1999, U.S. Appln. No. 60/137,725 filed on 07-Jun-  
35 1999, U.S. Appln. No. 60/145,220 filed on 23-Jul-1999, U.S. Appln. No. 60/149,182 filed on 17-Aug-1999, U.S. Appln. No. 60/152,317 filed on 03-Sep-1999, U.S. Appln. No. 60/152,315 filed on 03-Sep-1999, U.S. Appln. No. 60/155,709 filed on 24-Sep-1999, U.S. Appln. No. 60/163,085 filed

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filed on 29-Oct-1999, U.S. Appln. No. 60/215,139 filed on 30-Jun-2000, U.S. Appln. No.  
60/162,211 filed on 29-Oct-1999, U.S. Appln. No. 60/215,138 filed on 30-Jun-2000, U.S. Appln.  
No. 60/162,240 filed on 29-Oct-1999, U.S. Appln. No. 60/215,131 filed on 30-Jun-2000, U.S.  
5 Appln. No. 60/162,237 filed on 29-Oct-1999, U.S. Appln. No. 60/219,666 filed on 21-Jul-2000,  
U.S. Appln. No. 60/162,238 filed on 29-Oct-1999, U.S. Appln. No. 60/215,134 filed on 30-Jun-  
2000, U.S. Appln. No. 60/163,580 filed on 05-Nov-1999, U.S. Appln. No. 60/215,130 filed on 30-  
Jun-2000, U.S. Appln. No. 60/163,577 filed on 05-Nov-1999, U.S. Appln. No. 60/215,137 filed on  
30-Jun-2000, U.S. Appln. No. 60/163,581 filed on 05-Nov-1999, U.S. Appln. No. 60/215,133 filed  
10 on 30-Jun-2000, U.S. Appln. No. 60/163,576 filed on 05-Nov-1999, U.S. Appln. No. 60/221,366  
filed on 27-Jul-2000, U.S. Appln. No. 60/164,344 filed on 09-Nov-1999, U.S. Appln. No.  
60/195,296 filed on 07-Apr-2000, U.S. Appln. No. 60/221,367 filed on 27-Jul-2000, U.S. Appln.  
No. 60/164,835 filed on 12-Nov-1999, U.S. Appln. No. 60/221,142 filed on 27-Jul-2000, U.S.  
Appln. No. 60/164,744 filed on 12-Nov-1999, U.S. Appln. No. 60/215,140 filed on 30-Jun-2000,  
15 U.S. Appln. No. 60/164,735 filed on 12-Nov-1999, U.S. Appln. No. 60/221,193 filed on 27-Jul-  
2000, U.S. Appln. No. 60/164,825 filed on 12-Nov-1999, U.S. Appln. No. 60/222,904 filed on 03-  
Aug-2000, U.S. Appln. No. 60/164,834 filed on 12-Nov-1999, U.S. Appln. No. 60/224,007 filed  
on 04-Aug-2000, U.S. Appln. No. 60/164,750 filed on 12-Nov-1999, U.S. Appln. No. 60/215,128  
filed on 30-Jun-2000, U.S. Appln. No. 60/166,415 filed on 19-Nov-1999, U.S. Appln. No.  
20 60/215,136 filed on 30-Jun-2000, U.S. Appln. No. 60/166,414 filed on 19-Nov-1999, U.S. Appln.  
No. 60/219,665 filed on 21-Jul-2000, U.S. Appln. No. 60/164,731 filed on 12-Nov-1999, U.S.  
Appln. No. 60/215,132 filed on 30-Jun-2000, U.S. Appln. No. 60/226,280 filed on 18-Aug-2000,  
U.S. Appln. No. 60/256,968 filed on 21-Dec-2000, U.S. Appln. No. 60/226,380 filed on 18-Aug-  
2000, U.S. Appln. No. 60/259,803 filed on 05-Jan-2001, U.S. Appln. No. 60/228,084 filed on 28-  
25 Aug-2000, U.S. Appln. No. 09/915,582 filed on 27-Jul-2001, U.S. Appln. No. 60/231,968 filed on  
12-Sep-2000, U.S. Appln. No. 60/236,326 filed on 29-Sep-2000, U.S. Appln. No. 60/234,211 filed  
on 20-Sep-2000, U.S. Appln. No. 60/226,282 filed on 18-Aug-2000, U.S. Appln. No. 60/232,104  
filed on 12-Sep-2000, U.S. Appln. No. 60/234,210 filed on 20-Sep-2000, U.S. Appln. No.  
60/226,278 filed on 18-Aug-2000, U.S. Appln. No. 60/259,805 filed on 05-Jan-2001, U.S. Appln.  
30 No. 60/226,279 filed on 18-Aug-2000, U.S. Appln. No. 60/259,678 filed on 05-Jan-2001, U.S.  
Appln. No. 60/226,281 filed on 18-Aug-2000, U.S. Appln. No. 60/231,969 filed on 12-Sep-2000,  
U.S. Appln. No. 60/228,086 filed on 28-Aug-2000, U.S. Appln. No. 60/259,516 filed on 04-Jan-  
2001, U.S. Appln. No. 60/228,083 filed on 28-Aug-2000, U.S. Appln. No. 60/259,804 filed on 05-  
Jan-2001, U.S. Appln. No. 60/270,658 filed on 23-Feb-2001, U.S. Appln. No. 60/304,444 filed on  
35 12-Jul-2001, U.S. Appln. No. 60/270,625 filed on 23-Feb-2001, U.S. Appln. No. 60/304,417 filed  
on 12-Jul-2001, U.S. Appln. No. 60/295,869 filed on 06-Jun-2001, U.S. Appln. No. 60/304,121  
filed on 11-Jul-2001, U.S. Appln. No. 60/311,085 filed on 10-Aug-2001, U.S. Appln. No.

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5 2001, U.S. Appln. No. 60/331,287 filed on 13-Nov-2001, U.S. Appln. No. 09/950,082 filed on 12-Sep-2001, U.S. Appln. No. 09/950,083 filed on 12-Sep-2001, PCT Appln. No. US00/29363 filed on 25-Oct-2000, PCT Appln. No. US00/29360 filed on 25-Oct-2000, PCT Appln. No. US00/29362 filed on 25-Oct-2000, PCT Appln. No. US00/29365 filed on 25-Oct-2000, PCT Appln. No. US00/29364 filed on 25-Oct-2000, PCT Appln. No. US00/30040 filed on 01-Nov-  
10 2000, PCT Appln. No. US00/30037 filed on 01-Nov-2000, PCT Appln. No. US00/30045 filed on 01-Nov-2000, PCT Appln. No. US00/30036 filed on 01-Nov-2000, PCT Appln. No. US00/30039 filed on 01-Nov-2000, PCT Appln. No. US00/30654 filed on 08-Nov-2000, PCT Appln. No. US00/30628 filed on 08-Nov-2000, PCT Appln. No. US00/30653 filed on 08-Nov-2000, PCT Appln. No. US00/30629 filed on 08-Nov-2000, PCT Appln. No. US00/30679 filed on 08-Nov-  
15 2000, PCT Appln. No. US00/30674 filed on 08-Nov-2000, PCT Appln. No. US00/31162 filed on 15-Nov-2000, PCT Appln. No. US00/31282 filed on 15-Nov-2000, PCT Appln. No. US00/30657 filed on 08-Nov-2000, PCT Appln. No. US01/01396 filed on 17-Jan-2001, PCT Appln. No. US01/01387 filed on 17-Jan-2001, PCT Appln. No. US01/01567 filed on 17-Jan-2001, PCT Appln. No. US01/01431 filed on 17-Jan-2001, PCT Appln. No. US01/01432 filed on 17-Jan-2001,  
20 PCT Appln. No. US01/00544 filed on 09-Jan-2001, PCT Appln. No. US01/01435 filed on 17-Jan-2001, PCT Appln. No. US01/01386 filed on 17-Jan-2001, PCT Appln. No. US01/01565 filed on 17-Jan-2001, PCT Appln. No. US01/01394 filed on 17-Jan-2001, PCT Appln. No. US01/01434 filed on 17-Jan-2001, PCT Appln. No. US01/01397 filed on 17-Jan-2001, PCT Appln. No. US01/01385 filed on 17-Jan-2001, PCT Appln. No. US01/01384 filed on 17-Jan-2001, PCT  
25 Appln. No. US01/01383 filed on 17-Jan-2001, PCT Appln. No. (Atty. Dkt. No. PS735; unassigned) filed on 21-Feb-2002, PCT Appln. No. (Atty. Dkt. No. PS736; unassigned) filed on 21-Feb-2002, U.S. Appln. No. 09/148,545 filed on 04-Sep-1998, U.S. Appln. No. 09/621,011 filed on 20-Jul-2000, U.S. Appln. No. 09/981,876 filed on 19-Oct-2001, U.S. Appln. No. 09/149,476 filed on 08-Sep-1998, U.S. Appln. No. 09/809,391 filed on 16-Mar-2001, U.S. Appln. No.  
30 09/882,171 filed on 18-Jun-2001, U.S. Appln. No. 60/190,068 filed on 17-Mar-2000, U.S. Appln. No. 09/152,060 filed on 11-Sep-1998, U.S. Appln. No. 09/852,797 filed on 11-May-2001, U.S. Appln. No. 09/853,161 filed on 11-May-2001, U.S. Appln. No. 09/852,659 filed on 11-May-2001, U.S. Appln. No. 10/058,993 filed on 30-Jan-2002, U.S. Appln. No. 60/265,583 filed on 02-Feb-  
35 2001, U.S. Appln. No. 09/154,707 filed on 17-Sep-1998, U.S. Appln. No. 09/966,262 filed on 01-Oct-2001, U.S. Appln. No. 09/983,966 filed on 26-Oct-2001, U.S. Appln. No. 10/059,395 filed on 31-Jan-2002, U.S. Appln. No. 09/984,245 filed on 29-Oct-2001, U.S. Appln. No. 09/166,780 filed on 06-Oct-1998, U.S. Appln. No. 09/577,145 filed on 24-May-2000, U.S. Appln. No. 09/814,122



filed on 22-Mar-2001, U.S. Appln. No. 09/189,144 filed on 10-Nov-1998, U.S. Appln. No. 09/690,454 filed on 18-Oct-2000, U.S. Appln. No. (Atty. Dkt. No. PZ006G13A; unassigned) filed on 05-Feb-2002, U.S. Appln. No. 10/062,599 filed on 05-Feb-2002, U.S. Appln. No. 09/205,258 filed on 04-Dec-1998, U.S. Appln. No. 09/933,767 filed on 22-Aug-2001, U.S. Appln. No. 5 60/184,836 filed on 24-Feb-2000, U.S. Appln. No. 60/193,170 filed on 29-Mar-2000, U.S. Appln. No. 10/023,282 filed on 20-Dec-2001, U.S. Appln. No. 10/004,860 filed on 07-Dec-2001, U.S. Appln. No. 09/209,462 filed on 11-Dec-1998, U.S. Appln. No. 09/213,365 filed on 17-Dec-1998, U.S. Appln. No. 09/627,081 filed on 27-Jul-2000, U.S. Appln. No. 09/227,357 filed on 08-Jan-1999, U.S. Appln. No. 09/983,802 filed on 25-Oct-2001, U.S. Appln. No. 09/973,278 filed on 10- 10 Oct-2001, U.S. Appln. No. 60/239,899 filed on 13-Oct-2000, U.S. Appln. No. 09/984,490 filed on 30-Oct-2001, U.S. Appln. No. 09/776,724 filed on 06-Feb-2001, U.S. Appln. No. 09/229,982 filed on 14-Jan-1999, U.S. Appln. No. 09/669,688 filed on 26-Sep-2000, U.S. Appln. No. 60/180,909 filed on 08-Feb-2000, U.S. Appln. No. 09/236,557 filed on 26-Jan-1999, U.S. Appln. No. 09/666,984 filed on 21-Sep-2000, U.S. Appln. No. 09/820,649 filed on 30-Mar-2001, U.S. Appln. 15 No. 60/295,558 filed on 05-Jun-2001, U.S. Appln. No. 09/244,112 filed on 04-Feb-1999, U.S. Appln. No. 09/774,639 filed on 01-Feb-2001, U.S. Appln. No. 09/969,730 filed on 04-Oct-2001, U.S. Appln. No. 60/238,291 filed on 06-Oct-2000, U.S. Appln. No. 09/251,329 filed on 17-Feb-1999, U.S. Appln. No. 09/716,128 filed on 17-Nov-2000, U.S. Appln. No. 09/257,179 filed on 25-Feb-1999, U.S. Appln. No. 09/729,835 filed on 06-Dec-2000, U.S. Appln. No. 09/262,109 filed on 20 04-Mar-1999, U.S. Appln. No. 09/722,329 filed on 28-Nov-2000, U.S. Appln. No. (Atty. Dkt. No. PZ016PIC1; unassigned) filed on 17-Jan-2002, U.S. Appln. No. 60/262,066 filed on 18-Jan-2001, U.S. Appln. No. 09/281,976 filed on 31-Mar-1999, U.S. Appln. No. 09/288,143 filed on 08-Apr-1999, U.S. Appln. No. 09/984,429 filed on 30-Oct-2001, U.S. Appln. No. 60/244,591 filed on 01-Nov-2000, U.S. Appln. No. 09/296,622 filed on 23-Apr-1999, U.S. Appln. No. 09/305,736 filed 25 on 05-May-1999, U.S. Appln. No. 09/818,683 filed on 28-Mar-2001, U.S. Appln. No. 09/974,879 filed on 12-Oct-2001, U.S. Appln. No. 60/239,893 filed on 13-Oct-2000, U.S. Appln. No. 09/334,595 filed on 17-Jun-1999, U.S. Appln. No. 09/348,457 filed on 07-Jul-1999, U.S. Appln. No. 09/739,907 filed on 20-Dec-2000, U.S. Appln. No. 09/938,671 filed on 27-Aug-2001, U.S. Appln. No. 09/363,044 filed on 29-Jul-1999, U.S. Appln. No. 09/813,153 filed on 21-Mar-2001, 30 U.S. Appln. No. 09/949,925 filed on 12-Sep-2001, U.S. Appln. No. 60/232,150 filed on 12-Sep-2000, U.S. Appln. No. 09/369,247 filed on 05-Aug-1999, U.S. Appln. No. 10/062,548 filed on 05-Feb-2002, U.S. Appln. No. 09/382,572 filed on 25-Aug-1999, U.S. Appln. No. 09/716,129 filed on 17-Nov-2000, U.S. Appln. No. 09/393,022 filed on 09-Sep-1999, U.S. Appln. No. 09/798,889 filed on 06-Mar-2001, U.S. Appln. No. 09/397,945 filed on 17-Sep-1999, U.S. Appln. No. 35 09/437,658 filed on 10-Nov-1999, U.S. Appln. No. 09/892,877 filed on 28-Jun-2001, U.S. Appln. No. 09/948,783 filed on 10-Sep-2001, U.S. Appln. No. 60/231,846 filed on 11-Sep-2000, U.S. Appln. No. 09/461,325 filed on 14-Dec-1999, U.S. Appln. No. 10/050,873 filed on 18-Jan-2002,

U.S. Appln. No. 60/263,230 filed on 23-Jan-2001, U.S. Appln. No. 60/263,681 filed on 24-Jan-2001, U.S. Appln. No. 10/012,542 filed on 12-Dec-2001, U.S. Appln. No. 09/482,273 filed on 13-Jan-2000, U.S. Appln. No. 60/234,925 filed on 25-Sep-2000, U.S. Appln. No. 09/984,276 filed on 29-Oct-2001, U.S. Appln. No. 09/984,271 filed on 29-Oct-2001, U.S. Appln. No. 09/489,847 filed on 24-Jan-2000, U.S. Appln. No. 60/350,898 filed on 25-Jan-2002, U.S. Appln. No. 09/511,554 filed on 23-Feb-2000, U.S. Appln. No. 09/739,254 filed on 19-Dec-2000, U.S. Appln. No. 09/904,615 filed on 16-Jul-2001, U.S. Appln. No. 10/054,988 filed on 25-Jan-2002, U.S. Appln. No. 09/531,119 filed on 20-Mar-2000, U.S. Appln. No. 09/820,893 filed on 30-Mar-2001, U.S. Appln. No. 09/565,391 filed on 05-May-2000, U.S. Appln. No. 09/948,820 filed on 10-Sep-2001, U.S. Appln. No. 09/591,316 filed on 09-Jun-2000, U.S. Appln. No. 09/895,298 filed on 02-Jul-2001, U.S. Appln. No. 09/618,150 filed on 17-Jul-2000, U.S. Appln. No. 09/985,153 filed on 01-Nov-2001, U.S. Appln. No. 09/628,508 filed on 28-Jul-2000, U.S. Appln. No. 09/997,131 filed on 30-Nov-2001, U.S. Appln. No. 09/661,453 filed on 13-Sep-2000, U.S. Appln. No. 10/050,882 filed on 18-Jan-2002, U.S. Appln. No. 09/684,524 filed on 10-Oct-2000, U.S. Appln. No. 10/050,704 filed on 18-Jan-2002, U.S. Appln. No. 09/726,643 filed on 01-Dec-2000, U.S. Appln. No. 10/042,141 filed on 11-Jan-2002, U.S. Appln. No. 09/756,168 filed on 09-Jan-2001, U.S. Appln. No. 09/781,417 filed on 13-Feb-2001, U.S. Appln. No. (Atty. Dkt. No. PZ042P1C1; unassigned) filed on 01-Feb-2002, U.S. Appln. No. 09/789,561 filed on 22-Feb-2001, U.S. Appln. No. 09/800,729 filed on 08-Mar-2001, U.S. Appln. No. 09/832,129 filed on 11-Apr-2001, PCT Appln. No.US98/04482 filed on 06-Mar-1998, PCT Appln. No.US98/04493 filed on 06-Mar-1998, PCT Appln. No.US98/04858 filed on 12-Mar-1998, PCT Appln. No.US98/05311 filed on 19-Mar-1998, PCT Appln. No.US98/06801 filed on 07-Apr-1998, PCT Appln. No.US98/10868 filed on 28-May-1998, PCT Appln. No.US98/11422 filed on 04-Jun-1998, PCT Appln. No.US01/05614 filed on 21-Feb-2001, PCT Appln. No.US98/12125 filed on 11-Jun-1998, PCT Appln. No.US98/13608 filed on 30-Jun-1998, PCT Appln. No.US98/13684 filed on 07-Jul-1998, PCT Appln. No.US98/14613 filed on 15-Jul-1998, PCT Appln. No.US98/15949 filed on 29-Jul-1998, PCT Appln. No.US98/16235 filed on 04-Aug-1998, PCT Appln. No.US98/17044 filed on 18-Aug-1998, PCT Appln. No.US98/17709 filed on 27-Aug-1998, PCT Appln. No.US98/18360 filed on 03-Sep-1998, PCT Appln. No.(Atty. Dkt. No. PZ016PCT2; unassigned) filed on 17-Jan-2002, PCT Appln. No.US98/20775 filed on 01-Oct-1998, PCT Appln. No.US98/21142 filed on 08-Oct-1998, PCT Appln. No.US98/22376 filed on 23-Oct-1998, PCT Appln. No.US98/23435 filed on 04-Nov-1998, PCT Appln. No.US98/27059 filed on 17-Dec-1998, PCT Appln. No.US99/00108 filed on 06-Jan-1999, PCT Appln. No.US99/01621 filed on 27-Jan-1999, PCT Appln. No.US99/02293 filed on 04-Feb-1999, PCT Appln. No.US99/03939 filed on 24-Feb-1999, PCT Appln. No.US99/05721 filed on 11-Mar-1999, PCT Appln. No.US99/05804 filed on 18-Mar-1999, PCT Appln. No.US99/09847 filed on 06-May-1999, PCT Appln. No.US99/13418 filed on 15-Jun-1999, PCT Appln. No.US99/15849 filed on 14-Jul-1999, PCT Appln. No.US01/00911 filed on 12-

Jan-2001, PCT Appln. No.US01/29871 filed on 24-Sep-2001, PCT Appln. No.US99/17130 filed on 29-Jul-1999, PCT Appln. No.US99/19330 filed on 24-Aug-1999, PCT Appln. No.US99/22012 filed on 22-Sep-1999, PCT Appln. No.US99/26409 filed on 09-Nov-1999, PCT Appln. No.US99/29950 filed on 16-Dec-1999, PCT Appln. No.US00/00903 filed on 18-Jan-2000, PCT  
5 Appln. No.US00/03062 filed on 08-Feb-2000, PCT Appln. No.US00/06783 filed on 16-Mar-2000, PCT Appln. No.US00/08979 filed on 06-Apr-2000, PCT Appln. No.US00/15187 filed on 02-Jun-2000, PCT Appln. No.US00/19735 filed on 20-Jul-2000, PCT Appln. No.US00/22325 filed on 16-Aug-2000, PCT Appln. No.US00/24008 filed on 31-Aug-2000, PCT Appln. No.US00/26013 filed on 22-Sep-2000, PCT Appln. No.US00/28664 filed on 17-Oct-2000, US Appln. No. 09/833,245  
10 filed on 12-Apr-2001, and PCT Appln. No. US01/11988 filed on 12-Apr-2001.

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PCT/US02/08278

Applicant's File

International Application

Reference Number: PS902PCT

Number: Unassigned

**INDICATIONS RELATING TO DEPOSITED BIOLOGICAL MATERIAL**

(PCT Rule 13bis)

A. The indications made below relate to the deposited biological material referred to in Table 1A of the description.

**B. IDENTIFICATION OF DEPOSIT:**

Further deposits are identified  
on an additional sheet: ☒

Name of Depository: American Type Culture Collection  
Address of Depository: 10801 University Boulevard  
Manassas, Virginia 20110-2209  
United States of America

	Accession Number	Date of Deposit		Accession Number	Date of Deposit
1	203027	26-Jun-1998	2	209125	19-Jun-1997
3	203069	27-Jul-1998	4	209126	19-Jun-1997
5	203070	27-Jul-1998	6	209138	3-Jul-1997
7	203071	27-Jul-1998	8	209139	3-Jul-1997
9	203081	30-Jul-1998	10	209141	9-Jul-1997
11	203105	13-Aug-1998	12	209145	17-Jul-1997
13	203181	9-Sep-1998	14	209146	17-Jul-1997
15	203331	8-Oct-1998	16	209147	17-Jul-1997
17	203364	19-Oct-1998	18	209148	17-Jul-1997
19	203484	17-Nov-1998	20	209177	24-Jul-1997
21	203499	1-Dec-1998	22	209179	24-Jul-1997
23	203517	10-Dec-1998	24	209180	24-Jul-1997
25	203570	11-Jan-1999	26	209195	1-Aug-1997
27	203648	9-Feb-1999	28	209197	8-Aug-1997
29	203858	18-Mar-1999	30	209215	21-Aug-1997
31	209007	28-Apr-1997	32	209224	28-Aug-1997
33	209009	28-Apr-1997	34	209225	28-Aug-1997
35	209010	28-Apr-1997	36	209226	28-Aug-1997
37	209011	28-Apr-1997	38	209236	4-Sep-1997
39	209012	28-Apr-1997	40	209241	12-Sep-1997
41	209022	8-May-1997	42	209242	12-Sep-1997
43	209070	22-May-1997	44	209243	12-Sep-1997
45	209071	22-May-1997	46	209244	12-Sep-1997
47	209072	22-May-1997	48	209277	18-Sep-1997
49	209073	22-May-1997	50	209299	25-Sep-1997
51	209074	22-May-1997	52	209300	25-Sep-1997
53	209076	22-May-1997	54	209324	2-Oct-1997
55	209080	29-May-1997	56	209346	9-Oct-1997
57	209081	29-May-1997	58	209368	16-Oct-1997
59	209082	29-May-1997	60	209407	23-Oct-1997
61	209083	29-May-1997	62	209423	30-Oct-1997
63	209085	29-May-1997	64	209463	14-Nov-1997
65	209086	29-May-1997	66	209511	3-Dec-1997
67	209089	5-Jun-1997	68	209551	12-Dec-1997
69	209090	5-Jun-1997	70	209563	18-Dec-1997
71	209118	12-Jun-1997	72	209568	6-Jan-1998

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PCT/US02/08278

Applicant's File

International Application

Reference Number: PS902PCT

Number: Unassigned

	Accession Number	Date of Deposit		Accession Number	Date of Deposit
73	209124	19-Jun-1997	74	209580	14-Jan-1998
75	209603	29-Jan-1998	76	PTA-2069	9-Jun-2000
77	209626	12-Feb-1998	78	PTA-2070	9-Jun-2000
79	209627	12-Feb-1998	80	PTA-2071	9-Jun-2000
81	209628	12-Feb-1998	82	PTA-2072	9-Jun-2000
83	209641	25-Feb-1998	84	PTA-2073	9-Jun-2000
85	209651	4-Mar-1998	86	PTA-2075	9-Jun-2000
87	209683	20-Mar-1998	88	PTA-2076	9-Jun-2000
89	209745	7-Apr-1998	90	PTA-2081	9-Jun-2000
91	209746	7-Apr-1998	92	PTA-2082	9-Jun-2000
93	209782	20-Apr-1998	94	PTA-322	9-Jul-1999
95	209852	7-May-1998	96	PTA-499	11-Aug-1999
97	209853	7-May-1998	98	PTA-622	2-Sep-1999
99	209877	18-May-1998	100	PTA-623	2-Sep-1999
101	209878	18-May-1998	102	PTA-841	13-Oct-1999
103	209889	22-May-1998	104	PTA-842	13-Oct-1999
105	209965	11-Jun-1998	106	PTA-843	13-Oct-1999
107	97922	7-Mar-1997	108	PTA-844	13-Oct-1999
109	97923	7-Mar-1997	110	PTA-845	13-Oct-1999
111	97955	13-Mar-1997	112	PTA-846	13-Oct-1999
113	97957	13-Mar-1997	114	PTA-847	13-Oct-1999
115	97958	13-Mar-1997	116	PTA-848	13-Oct-1999
117	97974	4-Apr-1997	118	PTA-849	13-Oct-1999
119	97975	4-Apr-1997	120	PTA-855	18-Oct-1999
121	97976	4-Apr-1997	122	PTA-867	26-Oct-1999
123	97977	4-Apr-1997	124	PTA-868	26-Oct-1999
125	97979	27-Mar-1997	126	PTA-872	26-Oct-1999
127	PTA-1543	21-Mar-2000	128	PTA-883	28-Oct-1999
129	PTA-1544	21-Mar-2000	130	PTA-884	28-Oct-1999
131	PTA-163	1-Jun-1999	132	PTA-885	28-Oct-1999

**EUROPE**

In respect of those designations in which a European Patent is sought a sample of the deposited microorganism will be made available until the publication of the mention of the grant of the European patent or until the date on which the application has been refused or withdrawn or is deemed to be withdrawn, only by the issue of such a sample to an expert nominated by the person requesting the sample (Rule 28(4) EPC).

**CANADA**

The applicant requests that, until either a Canadian patent has been issued on the basis of an application or the application has been refused, or is abandoned and no longer subject to reinstatement, or is withdrawn, the Commissioner of Patents only authorizes the furnishing of a sample of the deposited biological material referred to in the application to an independent expert nominated by the Commissioner, the applicant must, by a written statement, inform the International Bureau accordingly before completion of technical preparations for publication of the international application.

**NORWAY**

The applicant hereby requests that the application has been laid open to public inspection (by the Norwegian Patent Office), or has been finally decided upon by the Norwegian Patent Office without having been laid open inspection, the furnishing of a sample shall only be effected to an expert in the art. The request to this effect shall be filed by the applicant with the Norwegian Patent Office not later than at the time when the application is made available to the public under Sections 22 and 33(3) of the Norwegian Patents Act. If such a request has been filed by the applicant, any request made by a third party for the furnishing of a sample shall indicate the expert to be used. That expert may be any person entered on the list of recognized experts drawn up by the Norwegian Patent Office or any person approved by the applicant in the individual case.

**AUSTRALIA**

The applicant hereby gives notice that the furnishing of a sample of a microorganism shall only be effected prior to the grant of a patent, or prior to the lapsing, refusal or withdrawal of the application, to a person who is a skilled addressee without an interest in the invention (Regulation 3.25(3) of the Australian Patents Regulations).

**FINLAND**

The applicant hereby requests that, until the application has been laid open to public inspection (by the National Board of Patents and Regulations), or has been finally decided upon by the National Board of Patents and Registration without having been laid open to public inspection, the furnishing of a sample shall only be effected to an expert in the art.

**UNITED KINGDOM**

The applicant hereby requests that the furnishing of a sample of a microorganism shall only be made available to an expert. The request to this effect must be filed by the applicant with the International Bureau before the completion of the technical preparations for the international publication of the application.

**DENMARK**

The applicant hereby requests that, until the application has been laid open to public inspection (by the Danish Patent Office), or has been finally decided upon by the Danish Patent office without having been laid open to public inspection, the furnishing of a sample shall only be effected to an expert in the art. The request to this effect shall be filed by the applicant with the Danish Patent Office not later than at the time when the application is made available to the public under Sections 22 and 33(3) of the Danish Patents Act. If such a request has been filed by the applicant, any request made by a third party for the furnishing of a sample shall indicate the expert to be used. That expert may be any person entered on a list of recognized experts drawn up by the Danish Patent Office or any person by the applicant in the individual case.

**SWEDEN**

The applicant hereby requests that, until the application has been laid open to public inspection (by the Swedish Patent Office), or has been finally decided upon by the Swedish Patent Office without having been laid open to public inspection, the furnishing of a sample shall only be effected to an expert in the art. The request to this effect shall be filed by the applicant with the International Bureau before the expiration of 16 months from the priority date (preferably on the Form PCT/RO/134 reproduced in annex Z of Volume I of the PCT Applicant's Guide). If such a request has been filed by the applicant any request made by a third party for the furnishing of a sample shall indicate the expert to be used. That expert may be any person entered on a list of recognized experts drawn up by the Swedish Patent Office or any person approved by a applicant in the individual case.

**NETHERLANDS**

The applicant hereby requests that until the date of a grant of a Netherlands patent or until the date on which the application is refused or withdrawn or lapsed, the microorganism shall be made available as provided in the 31F(1) of the Patent Rules only by the issue of a sample to an expert. The request to this effect must be furnished by the applicant with the Netherlands Industrial Property Office before the date on which the application is made available to the public under Section 22C or Section 25 of the Patents Act of the Kingdom of the Netherlands, whichever of the two dates occurs earlier.

*What Is Claimed Is:*

1. Use of a polypeptide for the preparation of a diagnostic or pharmaceutical composition for diagnosing or treating an immune disorder, wherein said polypeptide comprises an amino acid sequence at least 95% identical to a sequence selected from the group consisting of:

(a) a full length polypeptide of SEQ ID NO:Y or a full length polypeptide encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(b) a predicted secreted form of SEQ ID NO:Y or a secreted form of the polypeptide encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(c) a polypeptide fragment of SEQ ID NO:Y or a polypeptide fragment encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(d) a polypeptide fragment of SEQ ID NO:Y or a polypeptide fragment encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A, wherein said fragment has biological activity;

(e) a polypeptide domain of SEQ ID NO:Y as referenced in Table 1B;

(f) a polypeptide domain of SEQ ID NO:Y as referenced in Table 2; and

(g) a predicted epitope of SEQ ID NO:Y as referenced in Table 1B.

2. Use of the polypeptide of claim 1, wherein said wherein said polypeptide comprises a heterologous amino acid sequence.

3. Use of a polypeptide for the preparation of a diagnostic or pharmaceutical composition for diagnosing or treating an immune disorder, wherein said polypeptide comprises an amino acid sequence selected from the group consisting of:

(a) a full length polypeptide of SEQ ID NO:Y or a full length polypeptide encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(b) a predicted secreted form of SEQ ID NO:Y or a secreted form of the polypeptide encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(c) a polypeptide fragment of SEQ ID NO:Y or a polypeptide fragment encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;



(d) a polypeptide fragment of SEQ ID NO:Y or a polypeptide fragment encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A, wherein said fragment has biological activity;

(e) a polypeptide domain of SEQ ID NO:Y as referenced in Table 1B;

(f) a polypeptide domain of SEQ ID NO:Y as referenced in Table 2; and

(g) a predicted epitope of SEQ ID NO:Y as referenced in Table 1B.

4. Use of the polypeptide of claim 3, wherein said polypeptide comprises a heterologous amino acid sequence.

5. Use of an antibody or fragment thereof for the preparation of a diagnostic or pharmaceutical composition for diagnosing or treating an immune disorder, wherein said antibody or fragment thereof binds a polypeptide comprising an amino acid sequence at least 95% identical to a sequence selected from the group consisting of:

(a) a full length polypeptide of SEQ ID NO:Y or a full length polypeptide encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(b) a predicted secreted form of SEQ ID NO:Y or a secreted form of the polypeptide encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(c) a polypeptide fragment of SEQ ID NO:Y or a polypeptide fragment encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(d) a polypeptide fragment of SEQ ID NO:Y or a polypeptide fragment encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A, wherein said fragment has biological activity;

(e) a polypeptide domain of SEQ ID NO:Y as referenced in Table 1B;

(f) a polypeptide domain of SEQ ID NO:Y as referenced in Table 2; and

(g) a predicted epitope of SEQ ID NO:Y as referenced in Table 1B.

6. Use of an antibody or fragment thereof for the preparation of a diagnostic or pharmaceutical composition for diagnosing or treating an immune disorder, wherein said antibody or fragment thereof binds a polypeptide selected from the group consisting of:

(a) a full length polypeptide of SEQ ID NO:Y or a full length polypeptide encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(b) a predicted secreted form of SEQ ID NO:Y or a secreted form of the polypeptide encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(c) a polypeptide fragment of SEQ ID NO:Y or a polypeptide fragment encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(d) a polypeptide fragment of SEQ ID NO:Y or a polypeptide fragment encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A, wherein said fragment has biological activity;

(e) a polypeptide domain of SEQ ID NO:Y as referenced in Table 1B;

(f) a polypeptide domain of SEQ ID NO:Y as referenced in Table 2; and

(g) a predicted epitope of SEQ ID NO:Y as referenced in Table 1B.

7. Use of a nucleic acid molecule for the preparation of a diagnostic or pharmaceutical composition for diagnosing or treating an immune disorder, wherein said nucleic acid molecule comprises a polynucleotide sequence at least 95% identical to a sequence selected from the group consisting of:

(a) a polynucleotide fragment of SEQ ID NO:X as referenced in Table 1A;

(b) a polynucleotide encoding a full length polypeptide of SEQ ID NO:Y or a full length polypeptide encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(c) a polynucleotide encoding a predicted secreted form of SEQ ID NO:Y or a secreted form of the polypeptide encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(d) a polynucleotide encoding a polypeptide fragment of SEQ ID NO:Y or a polypeptide fragment encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(e) a polynucleotide encoding a polypeptide fragment of SEQ ID NO:Y or a polypeptide fragment encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A, wherein said fragment has biological activity;

(f) a polynucleotide encoding a polypeptide domain of SEQ ID NO:Y as referenced in Table 1B;

(g) a polynucleotide encoding a polypeptide domain of SEQ ID NO:Y as referenced in Table 2; and

(h) a polynucleotide encoding a predicted epitope of SEQ ID NO:Y as referenced in Table 1B.

8. Use of the nucleic acid molecule of claim 7, wherein said nucleic acid molecule comprises a heterologous polynucleotide sequence.

9. Use of a nucleic acid molecule for the preparation of a diagnostic or pharmaceutical composition for diagnosing or treating an immune disorder, wherein said nucleic acid molecule comprises a polynucleotide sequence selected from the group consisting of:

- (a) a polynucleotide fragment of SEQ ID NO:X as referenced in Table 1A;
- (b) a polynucleotide encoding a full length polypeptide of SEQ ID NO:Y or a full length polypeptide encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;
- (c) a polynucleotide encoding a predicted secreted form of SEQ ID NO:Y or a secreted form of the polypeptide encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;
- (d) a polynucleotide encoding a polypeptide fragment of SEQ ID NO:Y or a polypeptide fragment encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;
- (e) a polynucleotide encoding a polypeptide fragment of SEQ ID NO:Y or a polypeptide fragment encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A, wherein said fragment has biological activity;
- (f) a polynucleotide encoding a polypeptide domain of SEQ ID NO:Y as referenced in Table 1B;
- (g) a polynucleotide encoding a polypeptide domain of SEQ ID NO:Y as referenced in Table 2; and
- (h) a polynucleotide encoding a predicted epitope of SEQ ID NO:Y as referenced in Table 1B.

10. Use of the nucleic acid molecule of claim 9, wherein said nucleic acid molecule comprises a heterologous polynucleotide sequence.

11. Use of an agonist or antagonist for the preparation of a pharmaceutical composition for treating an immune disorder, wherein said agonist or antagonist binds a polypeptide comprising an amino acid sequence at least 95% identical to a sequence selected from the group consisting of:

- (a) a full length polypeptide of SEQ ID NO:Y or a full length polypeptide encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(b) a predicted secreted form of SEQ ID NO:Y or a secreted form of the polypeptide encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(c) a polypeptide fragment of SEQ ID NO:Y or a polypeptide fragment encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(d) a polypeptide fragment of SEQ ID NO:Y or a polypeptide fragment encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A, wherein said fragment has biological activity;

(e) a polypeptide domain of SEQ ID NO:Y as referenced in Table 1B;

(f) a polypeptide domain of SEQ ID NO:Y as referenced in Table 2; and

(g) a predicted epitope of SEQ ID NO:Y as referenced in Table 1B.

12. Use of an agonist or antagonist for the preparation of a pharmaceutical composition for treating an immune disorder, wherein said agonist or antagonist binds a polypeptide selected from the group consisting of:

(a) a full length polypeptide of SEQ ID NO:Y or a full length polypeptide encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(b) a predicted secreted form of SEQ ID NO:Y or a secreted form of the polypeptide encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(c) a polypeptide fragment of SEQ ID NO:Y or a polypeptide fragment encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(d) a polypeptide fragment of SEQ ID NO:Y or a polypeptide fragment encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A, wherein said fragment has biological activity;

(e) a polypeptide domain of SEQ ID NO:Y as referenced in Table 1B;

(f) a polypeptide domain of SEQ ID NO:Y as referenced in Table 2; and

(g) a predicted epitope of SEQ ID NO:Y as referenced in Table 1B.

13. A polypeptide comprising an amino acid sequence at least 95% identical to a sequence selected from the group consisting of:

(a) a full length polypeptide of SEQ ID NO:Y or a full length polypeptide encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(b) a predicted secreted form of SEQ ID NO:Y or a secreted form of the polypeptide encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(c) a polypeptide fragment of SEQ ID NO:Y or a polypeptide fragment encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(d) a polypeptide fragment of SEQ ID NO:Y or a polypeptide fragment encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A, wherein said fragment has biological activity;

(e) a polypeptide domain of SEQ ID NO:Y as referenced in Table 1B;

(f) a polypeptide domain of SEQ ID NO:Y as referenced in Table 2; and

(g) a predicted epitope of SEQ ID NO:Y as referenced in Table 1B.

14. The polypeptide of claim 13, wherein said polypeptide comprises a heterologous amino acid sequence.

15. Use of the polypeptide of claim 13 for identifying a binding partner comprising:

(a) contacting the polypeptide of claim 13 with a binding partner; and

(b) determining whether the binding partner increases or decreases activity of the polypeptide.

16. A polypeptide comprising an amino acid sequence selected from the group consisting of:

(a) a full length polypeptide of SEQ ID NO:Y or a full length polypeptide encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(b) a predicted secreted form of SEQ ID NO:Y or a secreted form of the polypeptide encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(c) a polypeptide fragment of SEQ ID NO:Y or a polypeptide fragment encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(d) a polypeptide fragment of SEQ ID NO:Y or a polypeptide fragment encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A, wherein said fragment has biological activity;

(e) a polypeptide domain of SEQ ID NO:Y as referenced in Table 1B;

(f) a polypeptide domain of SEQ ID NO:Y as referenced in Table 2; and

(g) a predicted epitope of SEQ ID NO:Y as referenced in Table 1B.

17. The polypeptide of claim 16, wherein said polypeptide comprises a heterologous polypeptide sequence.

18. Use of the polypeptide of claim 16 for identifying a binding partner comprising:

- (a) contacting the polypeptide of claim 16 with a binding partner; and
- (b) determining whether the binding partner increases or decreases activity of the polypeptide.

19. An antibody or fragment thereof that binds a polypeptide comprising an amino acid sequence at least 95% identical to a sequence selected from the group consisting of:

(a) a full length polypeptide of SEQ ID NO:Y or a full length polypeptide encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(b) a predicted secreted form of SEQ ID NO:Y or a secreted form of the polypeptide encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(c) a polypeptide fragment of SEQ ID NO:Y or a polypeptide fragment encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(d) a polypeptide fragment of SEQ ID NO:Y or a polypeptide fragment encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A, wherein said fragment has biological activity;

(e) a polypeptide domain of SEQ ID NO:Y as referenced in Table 1B;

(f) a polypeptide domain of SEQ ID NO:Y as referenced in Table 2; and

(g) a predicted epitope of SEQ ID NO:Y as referenced in Table 1B.

20. An antibody or fragment thereof that binds a polypeptide selected from the group consisting of:

(a) a full length polypeptide of SEQ ID NO:Y or a full length polypeptide encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(b) a predicted secreted form of SEQ ID NO:Y or a secreted form of the polypeptide encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(c) a polypeptide fragment of SEQ ID NO:Y or a polypeptide fragment encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(d) a polypeptide fragment of SEQ ID NO:Y or a polypeptide fragment encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A, wherein said fragment has biological activity;

(e) a polypeptide domain of SEQ ID NO:Y as referenced in Table 1B;

(f) a polypeptide domain of SEQ ID NO:Y as referenced in Table 2; and

(g) a predicted epitope of SEQ ID NO:Y as referenced in Table 1B.

21. A nucleic acid molecule comprising a polynucleotide sequence at least 95% identical to a sequence selected from the group consisting of:

(a) a polynucleotide fragment of SEQ ID NO:X as referenced in Table 1A;

(b) a polynucleotide encoding a full length polypeptide of SEQ ID NO:Y or a full length polypeptide encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(c) a polynucleotide encoding a predicted secreted form of SEQ ID NO:Y or a secreted form of the polypeptide encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(d) a polynucleotide encoding a polypeptide fragment of SEQ ID NO:Y or a polypeptide fragment encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;

(e) a polynucleotide encoding a polypeptide fragment of SEQ ID NO:Y or a polypeptide fragment encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A, wherein said fragment has biological activity;

(f) a polynucleotide encoding a polypeptide domain of SEQ ID NO:Y as referenced in Table 1B;

(g) a polynucleotide encoding a polypeptide domain of SEQ ID NO:Y as referenced in Table 2; and

(h) a polynucleotide encoding a predicted epitope of SEQ ID NO:Y as referenced in Table 1B.

22. The nucleic acid molecule of claim 21, wherein said nucleic acid molecule comprises a heterologous polynucleotide sequence.

23. A recombinant vector comprising the nucleic acid molecule of claim 21.

24. A recombinant vector comprising the nucleic acid molecule of claim 22.
25. A recombinant host cell comprising the recombinant vector of claim 23.
26. A recombinant host cell comprising the recombinant vector of claim 24.
27. A nucleic acid molecule comprising a polynucleotide sequence selected from the group consisting of:
- (a) a polynucleotide fragment of SEQ ID NO:X as referenced in Table 1A;
  - (b) a polynucleotide encoding a full length polypeptide of SEQ ID NO:Y or a full length polypeptide encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;
  - (c) a polynucleotide encoding a predicted secreted form of SEQ ID NO:Y or a secreted form of the polypeptide encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;
  - (d) a polynucleotide encoding a polypeptide fragment of SEQ ID NO:Y or a polypeptide fragment encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A;
  - (e) a polynucleotide encoding a polypeptide fragment of SEQ ID NO:Y or a polypeptide fragment encoded by the cDNA Clone ID in ATCC Deposit No:Z corresponding to SEQ ID NO:Y as referenced in Table 1A, wherein said fragment has biological activity;
  - (f) a polynucleotide encoding a polypeptide domain of SEQ ID NO:Y as referenced in Table 1B;
  - (g) a polynucleotide encoding a polypeptide domain of SEQ ID NO:Y as referenced in Table 2; and
  - (h) a polynucleotide encoding a predicted epitope of SEQ ID NO:Y as referenced in Table 1B.
28. The nucleic acid molecule of claim 27, wherein said nucleic acid molecule comprises a heterologous polynucleotide sequence.
29. A recombinant vector comprising the nucleic acid molecule of claim 27.
30. A recombinant vector comprising the nucleic acid molecule of claim 28.
31. A recombinant host cell comprising the recombinant vector of claim 29.
32. A recombinant host cell comprising the recombinant vector of claim 30.



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